

TORONTO AREA WATERSHED MANAGEMENT STRATEGY STUDY

INTERIM REPORT ON TORONTO AREA WATER QUALITY

April, 1983

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**Ministry
of the
Environment**

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Deputy Minister

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April 1983

Ontario Ministry of the Environment
135 St. Clair Avenue West
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1. INTRODUCTION

The five-year Toronto Area Watershed Management Strategy Study (TAWMS) was initiated in 1981 by the Ministry of the Environment. Although wholly funded and managed by MOE, TAWMS receives extensive cooperation and support from the Metropolitan Toronto and Region Conservation Authority and from the Boroughs and Cities of the Municipality of Metropolitan Toronto. This multi-agency approach is vital to the success of the project and to the implementation of study recommendations.

The purpose of the study is to seek out locations in Toronto where water quality requires improvement, and to develop cost-effective measures for achieving that improvement. The study's overall goal is to produce a comprehensive water quality management plan for the Toronto area watershed, with particular emphasis on the Don and Humber Rivers and Mimico Creek. The TAWMS study area is shown in Figure 1.

This report summarizes work carried out in the first year of TAWMS which was directed towards a closer definition of existing water quality conditions within the study area. The work relied heavily on historical and recent water quality data collected through the routine sampling programs of MOE and other agencies, but also made use of information from a limited sampling program undertaken by TAWMS in 1981 to supplement the routine data base.

This report provides additional information which supplements the findings of the Ministry of the Environment's Central Region 1979 report "Water Quality Indices of Streams in the Ministry of the Environment Central Region", which was based only on 1978 data.

2. DATA BASE

2.1 Existing Data:

The existing data base incorporated information from a number of programs within MOE. Most of the data are for conventional pollutants such as nutrients and bacteria; data for heavy metals and trace organics are only available for a few locations near the mouths of the Don and Humber rivers. The locations of routine program station are described in Table 1 and shown in Figures 1-4. Only data from 1978-1981 were utilized in this analysis to ensure that results are representative of conditions prevailing in 1981. 1978-1980 data were drawn from the Provincial Stream Quality Monitoring Network; 1980 data were derived from the MOE Enhanced Tributary Monitoring Program.

2.2 TAWMS Surveys, 1981:

A sampling program was undertaken by TAWMS in 1981 to supplement existing data, especially for heavy metals and trace organic contaminants such as pesticides and industrial chemicals. However, as some of these compounds are difficult to detect in water samples (because of low concentrations and insolubility), TAWMS also collected stream bed sediment and clam and fish tissue samples, both of which have been demonstrated to accumulate and concentrate a number of trace contaminants.

Two TAWMS surveys (September 25, 1981 and October 1, 1981) were conducted at twelve river and six sewage treatment plant effluent stations. The surveys were designed to represent baseline and storm conditions, respectively. All samples were analyzed for nutrients, metals and physical parameters such as turbidity; the storm samples were also analyzed for trace contaminants. TAWMS station locations are described in Table 1 and shown in Figure 1.

Bed sediment samples (top 5 cm) from special TAWMS surveys, collected using coring and dredge apparatus, were subjected to analyses for particle size and nutrient, heavy metal, PCBs, organochlorine and other pesticide concentrations.

Tissues from freshwater clams caged at 12 stations for 21 days were analysed for PCBs, organochlorine and other pesticide concentrations. Other biological monitoring involved the collection of juvenile fish from 9 locations in the Humber and Don rivers and analysis of their tissues for the same contaminants.

2.3 Data Interpretation

In reviewing the results of all surveys, it is important to note that up until approximately October, 1981, the Pugsley and North Don sewage treatment plants in Richmond Hill, and the John Street plant in Thornhill, were in operation and discharged their treated effluent to the Don River system. In the late fall of 1981, these plants were removed and their sewage flows directed to the York Durham sewer system for treatment at the Duffin Creek plant. The North Toronto plant is now the only remaining municipal sewage treatment plant discharging to the Don River.

All data presented in this report have been compared against Provincial Water Quality Objectives where possible. In some cases, where no objective or criterion has been defined for a parameter (often the case for trace organic compounds), the presence or absence of the contaminant has simply been noted.

3. RESULTS AND DISCUSSION

3.1 Bacteria:

All rivers in the study area were moderately to severely contaminated with coliform bacteria. Most stations in the three watersheds showed geometric mean total coliform bacteria densities which exceeded Provincial Water Quality Objectives for total body contact recreation. Fecal coliforms also exceeded objectives at all locations except for the headwaters of the Main Humber River (near Bolton), and the mouths of the East and West Humber rivers. As expected, individual concentrations of bacteria were extremely variable, especially at those stations downstream of storm sewers, combined sewer overflows, or sewage treatment plant (STP) discharges (where wet weather bypass of normal operation may occur). Geometric mean bacterial results are illustrated in Figures 2-7.

This bacterial contamination poses a potential public health hazard where people wade, swim or bathe and therefore curtails recreational use of the river waters.

3.2 Nutrients:

Total phosphorus levels were high throughout the study area, even in the headwater areas of the Humber and Don Rivers (see Figures 8-10 and Table 2). Concentrations exceeded the 0.03 mg/L guideline to avoid nuisance algae growth in streams, and exceeded 1.0 mg/L in upper German Mills Creek where the Pugsley Sewage Treatment Plant was located (Station 85-005, Figure 10). Filtered reactive phosphorus levels tended to be higher at river mouths than in headwater reaches and comprise anywhere from 5% to 94% of total phosphorus (Table 2). Higher

proportions of filtered reactive phosphorus (greater than 30-40% of total phosphorus) are typical of sewage treatment plant effluents and combined sewer overflows. The higher concentrations of this parameter in downstream reaches undoubtedly reflect the presence of these discharges in urbanized areas. Un-ionized ammonia concentrations were generally within the 0.02 mg/L objective for the protection of aquatic biota, except in areas known to receive STP discharges, stormwater runoff, or combined sewer overflows. Most often in violation of the objective for this parameter were the mouth of Black Creek and the Don River downstream of the confluence with Taylor Creek (Table 3).

In routine and TAWMS sediment sampling total phosphorus was always and total Kjeldahl nitrogen often in excess of MOE guidelines for the open water disposal of dredged material (Persaud and Wilkins, 1976). The results of these sediment sample analyses are presented in Tables 4 and 5.

High nutrient concentrations in sediments were often associated with high percentages of organic material in the sediment (expressed as loss on ignition), suggesting an organic source or sources of contamination such as stormwater runoff, combined sewer overflows, or sewage treatment plant outfalls. Analyses of sewage treatment plant effluents did in fact show very high concentrations of total phosphorus (although the measured values may not be representative of typical conditions; see note in Table 6), filtered reactive phosphorus, total Kjeldahl nitrogen, filtered ammonia, nitrate and nitrite (Table 6). These nutrient levels provide the potential for excessive plant growth wherever physical conditions are conducive to it. No data are yet available on the nutrient concentrations present in combined sewage and urban stormwater runoff so the importance of these sources in generating nutrient loadings to the stream remains uncertain at present.

3.3 Dissolved Oxygen

Limited routine dissolved oxygen monitoring carried out on the watersheds under daytime conditions has shown that dissolved oxygen concentrations in the study area generally meet the objective for that parameter. No additional monitoring was carried out as part of the TAWMS program, but special oxygen studies which will include both night and daytime data collection are planned in future phases of TAWMS.

3.4 Water Clarity and Conductivity:

Suspended solids concentrations were moderately high throughout the study watersheds (Table 2, Figures 11-13). The mouth of the Humber River (Station 83-001) and the Don River at Pottery Road (Station 85-014, about 4 km upstream of the mouth) exhibited the highest annual mean daily concentrations in the study area. Lowest levels were observed in the background Humber River station at Bolton. Turbidity measurements in the watersheds corroborated these observations, with highest turbidity usually found in the river sections farthest downstream (Table 2, Figures 14-16). This pattern would suggest that urban storm runoff and instream and bank erosion contribute suspended material to the streams.

Conductivity displayed patterns similar to those observed for nutrient and clarity parameters (Table 2, Figures 17-19). Highest conductance was seen in more heavily urbanized portions of the watersheds and lowest conductance in the headwaters of the Humber River. In general, conductance was highest during the low flow survey (September 25, 1981) and lowest during the storm survey (October 1, 1981), presumably because of dilution effects during high flows. Elevated chloride concentrations are sometimes responsible for high conductance; primary sources of chloride in urban areas are road salt in winter, and sewage treatment plant and combined sewer outfalls year-round. Large fluctuations and high winter chloride concentrations have in fact been measured in Toronto area rivers (Ralston and Hamilton, 1978) and it is believed that deicing salt is a large local source of that chloride.

3.5 Heavy Metals:

Heavy metals data, like data for trace organic compounds, were very limited for the Toronto watersheds. Most historic observations were for stations close to the mouths of the Don and Humber Rivers. At those stations, data were available for copper, zinc, lead, cadmium and mercury, but mercury results were for unfiltered samples and were difficult to interpret in light of the filtered-water criterion of 0.2 ug/L. Of the other parameters, copper and zinc most frequently exceeded the provincial water quality objectives, with cadmium and lead also occasionally in violation (Table 7). TAWMS sampling results showed similar patterns (Table 8). Chromium, which was also measured in the TAWMS program, showed no violation of objectives. Generally, heavy metal concentrations were higher in the Don than in the Humber River.

Routine surface bed sediment samples from two stations in the watersheds showed that copper, chromium, zinc, cadmium and lead approach or exceed MOE dredging guidelines at both stations monitored (Table 4). TAWMS sediment sampling revealed violations of the guidelines for those parameters only near the mouth of the Humber River and, for lead, at the mouth of Black Creek (Table 5).

Sewage treatment plant effluents entering the rivers were also observed to contain high concentrations of copper, zinc, cadmium and lead during both TAWMS surveys in 1981 (Table 9). As with other parameters such as nutrients, it is likely that the discharge of sewage treatment plant effluents into the streams, and storm runoff from urbanized areas, are largely responsible for heavy metal contamination in the receiving streams of the watersheds.

It should be noted that all these metals (copper, nickel, cadmium, chromium, lead and zinc) are widely used in the Great Lakes basin for a variety of industrial purposes, including

metallurgy and metal fabricating, manufacturing of electronics, pigments, paints and glazes, photography, lithography and the production of chemical products. The burning of fossil fuels, including coal, oil, and gasoline, releases quantities of heavy metals into the atmosphere and thus onto streets and other land surfaces, from which they may be washed into stream waters. The relative significance of these various sources in generating heavy metal loadings to the streams remains uncertain but will receive continuing investigation in future phases of TAWMS.

3.6 Trace Contaminants:

Routine and TAWMS monitoring programs in the study area showed that 14 PCB/organochlorine compounds of 22 analysed have been detected in river water samples (see Tables 10 and 11). A number of these compounds were found in concentrations exceeding provincial objectives. PCB's were the most commonly found contaminant, often in violation of the objective for that parameter. PCP (pentachlorophenol) concentrations only rarely occurred in detectable concentrations in the 1981 TAWMS survey. The compounds most frequently detected in river water samples were α BHC, γ BHC (Lindane), and Dieldrin; γ BHC (Lindane) and Dieldrin were both in violation of the provincial water quality objectives. Other parameters occurred with variable frequency. Of those with objective levels established, Heptachlor Epoxide and Endrin were found in concentrations higher than the provincial objectives in the single TAWMS survey.

However, it must be emphasized that most compounds were not detectable in water samples. Those not detected include Heptachlor, Aldrin, Mirex, α Chlordane, γ Chlordane, oxy Chlordane, most metabolites of DDT, methoxychlor, all carbamates examined, all orthophosphate pesticides examined

except Diazinon, most triazine herbicides examined and most chlorophenoxy/chlorobenzoic acid herbicides examined (see Tables 11-15).

In general, the parameters found in detectable concentrations in the Toronto area streams were similar to those found in four other Ontario and nine U.S. urban river systems (O'Neill, 1979; EPA, 1982). Contaminant concentrations in all the Ontario and U.S. systems were observed to vary widely; this may be attributable in part to differences in analytical techniques among laboratories. However, it can be concluded that the Humber and Don Rivers and Mimico Creek do not differ significantly from other similar systems in terms of trace organic compound contamination. It is difficult to make direct comparisons between river systems, since the particular set of contaminants found in any one system is probably largely dependent on the industrial mix in the system watershed.

(Note that no MOE objectives now exist for α BHC, PCP, 2,4,5-T and many other compounds. The reader is referred to the MOE publication Water Management Goals, Policies, Objectives and Implementation Procedures (November, 1978) for details of guidelines.)

Sediment samples taken throughout the watersheds in routine and TAWMS monitoring revealed detectable concentrations of PCBs, Σ DDT, Σ BHC, Σ Chlordane and Heptachlor Epoxide at a very few sites, notably the mouth of the Humber River. Thiodan II (Endosulfan) was also found in the Humber River at several sediment sampling locations. However, as with water samples, most compounds were not detected at most stations (Tables 16 and 17).

*Note: " Σ " implies "total".

Clams (Elliptio complanatus) left caged in the study area for three weeks concentrated detectable levels of PCBs, Σ DDT, Σ Chlordane, Heptachlor Epoxide and α and γ isomers of BHC). Other compounds less commonly found were HCB, Thiodan I and Dieldrin (see Table 18).

Young-of-the-year fish collected from stations in the three watersheds also had accumulated detectable concentrations of PCB's, Σ DDT, Σ BHC and Σ Chlordane (Table 19). Lowest concentrations in the fish tissue were observed in those samples obtained from the less urbanized section of the Humber River at Finch Avenue, while the highest concentrations were found in heavily urbanized areas such as Black Creek and the Don River. Table 19 shows that several species were used in the 1981 surveys, depending on location (some species were not found at some locations). Caution must therefore be used in comparing data from one species to another until differences (if any) in the bioaccumulation mechanisms of the species are more closely defined.

Upstream of the mouth of the Humber River, only common shiners were collected; in that stretch, very high levels of PCBs were noted at the Scarlett Road site (F4), suggesting the possibility of a source of PCBs there. It should also be noted that a significant decline was observed from 1977 to 1979 in PCB residues in spottail shiners from the mouth of the Humber River (Suns et al., 1981). 1977 levels approached 2200 ng/g, dropping to about 1200 ng/g in 1979. Table 19 demonstrates a further reduction in 1981 to about 950 ng/g.

Finally, it must be emphasized that most of the trace contaminants discussed above have been monitored for fewer than five years, so it is difficult to assess trends over time.

4. CONCLUSIONS

Recent water quality data from the Don and Humber Rivers and Mimico Creek demonstrate that the urbanized portions of those watersheds exhibit the poorest water quality. The Don River and Mimico and Black Creek watersheds are almost entirely urbanized at present and show the most degraded water quality overall. The West and Main Humber Rivers exhibit relatively good water quality at stations farthest upstream, but with increasing distance downstream, progressive water quality deterioration is apparent. In general, sediment and biological tissue samples corroborate findings from water samples, although more trace organic compounds were detected in sediment and biota than were found in water samples. However, because the data base for heavy metals and trace organic compounds is so limited in areal and temporal extent, conclusions about the nature and implications of data for those compounds must be considered only tentative at present.

The following paragraphs summarize the conclusions formulated from the Phase I work.

1. Bacterial densities throughout the urbanized portions of the watersheds indicate continuing contamination of surface waters, to the extent that body-contact recreation often must be restricted at locations in the watersheds.
2. Nutrient concentrations throughout the watersheds indicate continuing enrichment of stream waters. This situation can potentially endanger aquatic life by promoting the growth of nuisance algae.
3. Suspended sediment and turbidity measurements indicate that substantial erosion is ongoing in the watersheds, both from instream processes and from sheet erosion carried by surface runoff.

4. Conductivities are high in urbanized portions of the watersheds, indicating substantial contributions of dissolved salts and minerals there; these probably arise in large part from urban runoff during storm events.
5. Copper, zinc, cadmium and lead in the rivers were often found at concentrations in excess of water quality objectives and in sediment at levels above guidelines for the open water disposal of dredged material. The extent of their occurrence in the study area is not yet well documented.
6. PCB's and organochlorine, triazine and chlorophenoxy/chlorobenzoic acid compounds were detected in water, sediment and biological tissue samples throughout the study area. In some samples at some locations, parameters with established objective levels were observed in excess of those levels. Most trace organic compounds for which water quality analyses were performed were found in low concentrations or were not detected. Sediment samples also showed undetectable levels for most compounds at most stations.

The limited data base available for these contaminants does, however, preclude the drawing of firm conclusions about their sources and pathways in the study area. However, the contaminants found in the Toronto area rivers appear similar to those observed in four other Ontario and nine U.S. urban river systems. Additional data to be collected in future phases of TAWMS are expected to shed light on this issue.

5. PROPOSED TAWMS ACTIVITIES, 1982-1986

1. Because the water quality in the rivers was observed to be worst in urbanized areas, future TAWMS activities will focus on those portions of the Don and Humber River and Mimico Creek basins within Metropolitan Toronto boundaries (i.e., south of Steeles Avenue).
2. Particular attention will be directed to further study of pollutants which are of most concern for public health reasons (i.e., bacteria), which are most persistent in aquatic systems (i.e., trace organic compounds), or whose distribution and severity of contamination in the study area are least well known (i.e., trace organics and heavy metals).
3. TAWMS activities will be divided into "source" studies of outfalls and other sources of contamination, and studies of the receiving stream waters. All TAWMS activities in the watersheds will be coordinated with ongoing waterfront monitoring programs.
4. Research efforts will be directed primarily to the abatement of water quality problems. Urban stormwater runoff, combined sewer overflows and sewage treatment plant effluents appear to have particular significance in the impairment of receiving stream water quality, especially with respect to bacteria, nutrients and heavy metals.
5. Water quality sampling programs will be designed to monitor and characterize sources such as storm flows, spring runoff from snowmelt, and individual effluents. In particular, a comprehensive effort will be undertaken to pair water quality sampling with hydrologic sampling under a variety of flow conditions to evaluate loadings of pollutants as well as their instantaneous concentrations at a particular location. This will aid in assessing the relative importance of each source in determining receiving water quality.

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TABLE 1: LOCATIONS OF STATIONS USED IN WATER, SEDIMENT AND BIOLOGICAL SAMPLE COLLECTION
ROUTINE DATA COLLECTION PROGRAM

Routine Station Number	Geographical Location
<u>Mimico Creek:</u>	
82-002	Mimico Creek at Richview Side Road
82-001	Mimico Creek at mouth (Highway 2)
<u>Humber River:</u>	
83-019	Humber River at Bloor Street
83-018	Humber River above Bolton (Albion Hills C. A.)
83-012	Black Creek at mouth (Scarlett Road)
83-005	Humber River at York-Peel County Line, Bolton
83-004	East Humber River at Bridge Pine Grove Road
83-003	Humber River at Highway 7, Woodbridge
83-002	West Humber River at Claireville Dam outlet, Claireville
83-001	Humber River at mouth (Lakeshore Boulevard)
<u>Don River:</u>	
85-014	Don River at Leaside (Pottery Road)
85-013	Don River at Bayview Exit from Don Valley Parkway
85-005	German Mills Creek north of Highway 7 (16th Avenue)
85-004	West Don River at Highway 7, west of Concord
85-003	East Don River above German Mills Creek
85-002	West Don River at Sheppard Avenue
85-001	Don River at mouth (Lakeshore Boulevard)

TABLE 1: LOCATIONS OF STATIONS USED IN WATER, SEDIMENT AND BIOLOGICAL SAMPLE COLLECTION (CONTINUED):
TAWMS DATA COLLECTION PROGRAM

Station Number (TAWMS Code) Geographical Location

Mimico Creek:

82-003 (12) Mimico Creek just above mouth (The Queensway)

Humber River:

83-022	(9)	West Humber River above confluence (Albion Road)
83-021	(8)	East Humber River above confluence (north of Highway 7)
83-020	(7)	Main Humber River above confluence (Highway 27)
83-019	(11)	Humber River at Bloor Street
83-018	(6)	Humber River above Bolton (Albion Hills C. A.)
83-012	(10)	Black Creek at mouth (Scarlett Road)

Don River:

85-017	(3)	Taylor Creek (Massey Creek) at mouth (Don Valley Parkway)
85-016	(4)	West Don River at confluence (Don Valley Parkway)
85-015	(2)	German Mills Creek at mouth
85-014	(5)	Don River at Leaside (Pottery Road)
85-003	(1)	East Don River above German Mills Creek

TABLE 1: LOCATIONS OF STATIONS USED IN WATER, SEDIMENT AND BIOLOGICAL SAMPLE COLLECTION
(CONTINUED)

Fish Sampling Station Number	Geographical Location
<u>Mimico Creek:</u>	
F11	Mimico Creek at mouth (Highway 2)
<u>Humber River:</u>	
F1	Humber River at mouth (Lakeshore Boulevard)
F2	Humber River at Bloor Street
F3	Black Creek at mouth (Scarlett Road)
F4	Humber River at Scarlett Road
F5	Humber River at Finch Avenue
<u>Don River:</u>	
F6	Don River below Bloor Street
F7	Don River at Pottery Road
F8	Don River at West Don R. confluence (Don Mills Road)
F9	Taylor Creek (Massey Creek) at mouth (Don Valley Parkway)
F10	Don River above Taylor Creek

TABLE 2: NUTRIENTS AND ASSOCIATED PHYSICAL/CHEMICAL PARAMETER CONCENTRATIONS IN WATERS OF
MIMICO CREEK: TAWMS SAMPLING PROGRAM, 1981

Stn.No. (TAWMS Code)	Sample Date	Tot. Phos.	Filt. React.	Tot. Kjedl Phos.	Filt. Amm.	NO_2	NO_3	Turb. FTU	Hard	Alk.	Pheno1 ug/L	pH S.U.	Temp °C	Cond umhos	Field DO	Susp. Solids
82-003(12) (Mouth)	25/09/81 01/10/81	0.038* 0.660*	0.022 0.110	0.49 1.55	0.018 0.010	0.008 0.035	0.590 0.540	0.7 50.0	267 99	182 76	L1 5	7.7 -	17.9 -	1000 345	8.6 -	3.4 283.0
Guideline		0.030														

*indicates observed concentration exceeds objective or guideline

- = no data; "L" = "less than".

All results in mg/L unless otherwise indicated.

Low flow sample September 25, 1981

Storm flow sample October 1, 1981

TABLE 2 (CONTINUED): NUTRIENTS AND ASSOCIATED PHYSICAL/CHEMICAL PARAMETER CONCENTRATIONS IN WATERS OF THE HUMBER RIVER: TAWMS SAMPLING PROGRAM, 1981

Stn.No. (TAWMS Code)	Sample Date	Tot. Phos.	Filt. React. Phos.	Tot. Kjedl Amm.	Filt. NO ₂	NO ₃	Turb. FTU	Hard	Alk.	Pheno1 ug/L	pH S.U.	Temp °C	Cond umhos	Field DO	Susp. Solids	
83-018 (6) (u/s Bolton)	25/09/81 01/10/81	0.028 0.028	0.009 0.007	0.35 0.27	0.020 0.020	0.004 0.003	0.300 0.420	0.8 1.5	242 227	216 219	L1 L1	8.3 7.3	11.5 8.0	465 480	9.4 9.4	3.0 0.4
83-020 (7) (Hwy 27)	25/09/81 01/10/81	0.019 0.070*	0.015 0.013	0.32 0.42	0.028 0.024	0.005 0.033	0.065 0.430	1.3 2.3	193 225	217 214	L1 L1	8.5 7.4	11.5 9.0	460 520	10.0 9.4	6.0 4.5
83-021 (8) (n.of Hwy 7)	25/09/81 01/10/81	0.009 0.020	0.002 0.001	0.32 0.30	0.006 0.004	0.001 0.002	0.020 0.045	1.0 1.6	242 267	243 250	L1 L1	8.2 7.3	12.0 9.0	580 620	9.4 8.6	2.3 0.4
83-022 (9) (Albion Rd)	25/09/81 01/10/81	0.020 0.255*	0.009 0.055	0.53 0.75	0.010 0.014	0.001 0.015	0.010 0.440	0.5 71.0	217 123	157 110	L1 2	8.7 7.8	15.0 9.2	670 370	10.6 8.3	3.0 96.9
83-012 (10) (Black Cr)	25/09/81 01/10/81	0.140* 0.985*	0.039 0.185	1.16 1.80	0.560 0.010	0.435 0.045	1.260 0.520	0.8 47.0	338 110	246 103	L1 7	7.6 -	17.9 -	1420 350	8.4 -	4.3 365.0
83-019 (11) (Bloor St)	25/09/81 01/10/81	0.020 0.620*	0.004 0.040	0.37 2.10	0.038 0.328	0.005 0.043	0.015 0.145	1.0 29.0	214 134	191 110	L1 5	7.8 -	17.0 -	620 400	8.3 -	8.3 308.0

Guideline 0.030

*indicates observed concentration exceeds objective or guideline

- = no data; "L" = "less than".

All results in mg/L unless otherwise indicated.

Low flow sample September 25, 1981

Storm flow sample October 1, 1981

TABLE 2 (CONTINUED): NUTRIENTS AND ASSOCIATED PHYSICAL/CHEMICAL PARAMETER CONCENTRATIONS IN WATERS OF THE DON RIVER: TAWMS SAMPLING PROGRAM, 1981

Stn.No. (TAWMS Code)	Sample Date	Tot. Phos.	Filt. React.	Tot. Kjedl Phos.	Filt. Amm.	NO ₂	NO ₃	Turb. FTU	Hard	Alk.	Phenol ug/L	pH S.U.	Temp °C	Cond umhos	Field DO	Susp. Solids
85-003 (1) (abv G.M.Cr)	25/09/81 01/10/81	0.385* 1.150*	0.360 0.250	0.90 2.75	- 0.006	0.005 0.006	4.350 0.970	1.4 25.0	277 160	244 209	6 147	7.4 8.0	13.0 9.5	750 540	7.8 7.9	7.8 227.0
85-015 (2) (Germ.M.Cr)	25/09/81 01/10/81	0.766* 1.250*	0.610 0.225	4.15 2.75	L.002 0.410	0.014 0.031	9.140 1.070	7.8 30.0	278 134	221 198	L1 9	7.9 7.8	13.5 9.5	900 410	8.8 8.4	24.3 668.0
85-017 (3) (Taylor Cr)	25/09/81 01/10/81	0.127* 0.695*	0.074 0.150	0.73 1.45	0.058 0.004	0.080 0.028	3.260 1.270	1.2 32.0	294 119	232 114	- 23	6.9 -	16.6 -	960 405	8.7 -	10.5 237.0
85-016 (4) (Don V. Pkwy)	25/09/81 01/10/81	0.054* 0.875*	0.026 0.155	0.52 1.65	0.070 0.006	0.036 0.012	1.210 1.390	1.6 19.0	285 122	225 116	L1 6	7.7 -	15.8 -	920 420	8.6 -	6.5 283.0
85-014 (5) (Pottery Rd)	25/09/81 01/10/81	0.650* 0.895*	0.180 0.160	5.10 2.30	L.002 L.002	0.002 0.004	2.100 1.900	1.7 31.0	262 138	223 149	5 10	7.8 -	16.4 -	920 470	8.7 -	29.5 338.0
Guideline		0.030														

*indicates observed concentration exceeds objective or guideline

- = no data; "L" = "less than".

All results in mg/L unless otherwise indicated.

Low flow sample September 25, 1981

Storm flow sample October 1, 1981

TABLE 3. UN-IONIZED AMMONIA CONCENTRATIONS IN WATERS OF THE DON AND HUMBER RIVERS AND MIMICO CREEK, 1978-80: ROUTINE MONITORING PROGRAM

<u>Mimico Creek:</u>		Richview	Mouth						
Station Number		<u>82-002</u>	<u>82-001</u>						
Mean		0.004	0.003						
Maximum		0.018	0.016						
Minimum		0.000	0.000						
Std. Deviation		0.004	0.004						
N		27	27						
% Exceeding Objective		0	0						
<u>Humber River:</u>									
Station Number		Bolton <u>83-018</u>	York-Peel <u>83-005</u>	BrPineGr <u>83-004</u>	Hwy 7 <u>83-003</u>	Dam Outlt <u>83-002</u>	Black Cr <u>83-012</u>	Mouth <u>83-001</u>	
Mean		0.000	0.006	0.001	0.002	0.003	0.018	0.004	
Maximum		0.002	0.029	0.003	0.008	0.010	0.063	0.011	
Minimum		0.000	0.000	0.000	0.000	0.000	0.002	0.001	
Std. Deviation		0.000	0.007	0.001	0.002	0.002	0.016	0.002	
N		21	26	21	27	21	28	21	
% Exceeding Objective		0	8	0	0	0	31	0	
<u>Don River:</u>									
Station Number		Hwy 7 <u>85-004</u>	Shep'rd <u>85-002</u>	G.M.Cr. <u>85-005</u>	abvGMCr <u>85-003</u>	DVPkwy <u>85-013</u>	Mouth <u>85-001</u>		
Mean		0.003	0.004	0.281	0.013	0.041	0.035		
Maximum		0.011	0.021	7.396	0.080	0.120	0.108		
Minimum		0.000	0.001	0.000	0.000	0.003	0.007		
Std. Deviation		0.003	0.004	1.369	0.018	0.033	0.025		
N		26	21	29	29	29	17		
% Exceeding Objective		0	7	38	17	66	72		

All results are in mg/L (ppm).

TABLE 4: TRACE METAL AND NUTRIENT CONCENTRATIONS IN SURFACE BED SEDIMENTS,
HUMBER RIVER AND DON RIVER: ROUTINE MONITORING, 1980

Station (Year)	Cd ug/g	Hg ug/g	Cu ug/g	Cr ug/g	Zn ug/g	Pb ug/g	LOI** %	TKN %	T. Phos %
<u>Humber River:</u>									
83-001 (1980) (Mouth)	3.3*	0.35*	85*	78*	410*	240*	9.0*	2.8*	1.1*
<u>Don River:</u>									
85-001 (1980) (Mouth)	8.4*	0.28	150*	140*	660*	380*	0.7	2.5*	1.7*
Guidelines	1.0	0.3	25	25	100	50	6.0	0.2	0.1

* concentration exceeds MOE guidelines for the open water disposal of dredged material (Persaud and Wilkins, 1976)

** LOI indicates percent loss on ignition (an indication of the organic content of a sediment sample).

TABLE 5: TRACE METAL AND NUTRIENT CONCENTRATIONS AND PARTICLE SIZE ANALYSES OF SURFACE BED SEDIMENTS IN MIMICO CREEK:
TAWMS SAMPLING PROGRAM, 1981

Station No.	TAWMS Code	Cd ug/g	Hg ug/g	Cu ug/g	Cr ug/g	Zn ug/g	Pb ug/g	LOI** %	TOC** ug/g	TKN %	T.Phos %	COO ug/g	Clay % L.004 .004-.06	Silt % .06-.5	Sand % .5-2	Sand % 2-50	Grav. %
82-003 (Mouth)	(12)	0.3	0.01	14.0	20.0	56.0	11.0	1.2	2700	0.2	0.6*	15000	-	1	11	46	42
Guideline		1.0	0.30	25.0	25.0	100.0	50.0	6.0	-	0.2	0.1	50000					

* Indicates that concentration is in excess of suggested guidelines (Persaud and Wilkins, 1976).

** LOI indicates percent loss on ignition (an indication of the organic content of a sediment sample).
TOC indicates total organic carbon content.

"Surface bed sediment" refers to the top 5 cm depth of sediment in the stream bed.

Particle size classes are measured in mm: results are reported as percent of total sample weight in each class.

"L" = "less than".

TABLE 5 (CONTINUED): TRACE METAL AND NUTRIENT CONCENTRATIONS AND PARTICLE SIZE ANALYSES OF SURFACE BED SEDIMENTS IN THE HUMBER RIVER: TAWMS SAMPLING PROGRAM, 1981

Station No.	TAWMS Code	Cd ug/g	Hg ug/g	Cu ug/g	Cr ug/g	Zn ug/g	Pb ug/g	LOI** %	TOC** ug/g	TKN %	T.Phos %	COO ug/g	Clay % L.004	Silt % .004-.06	Sand % .06-.5	Sand % .5-2	Grav. % 2-50
83-018 (Bolton)	(6)	0.3	0.01	3.3	7.0	12.0	5.5	1.7	5200	0.5*	0.4*	18000	-	6	63	19	12
83-020 (Hwy 27)	(7)	0.3	0.01	6.5	8.5	16.0	3.5	0.6	2000	0.2	0.6*	23000	-	6	58	25	11
83-021 (n of Hwy 7)	(8)	0.3	0.01	9.5	7.5	19.0	5.3	1.0	8000	0.4*	0.6*	26000	3	11	35	12	39
83-022 (Albion Rd)	(9)	0.3	0.01	15.0	12.0	51.0	19.0	1.0	5200	0.3*	0.6*	23000	-	-	10	25	65
83-012 (Black Cr)	(10)	0.4	0.01	17.0	15.0	70.0	200.0*	0.8	3400	0.3*	0.5*	14000	-	-	15	48	37
83-001 (Mouth)		1.2*	0.11	47.0*	55.0*	250.0*	150.0*	5.4	24000	1.6*	1.1*	89000*	40	52	4	1	1
Guideline		1.0	0.30	25.0	25.0	100.0	50.0	6.0	-	0.2	0.1	50000					

* Indicates that concentration is in excess of suggested guidelines (Persaud and Wilkins, 1976).

** LOI indicates percent loss on ignition (an indication of the organic content of a sediment sample).
TOC indicates total organic carbon content.

"Surface bed sediment" refers to the top 5 cm depth of sediment in the stream bed.

Particle size classes are measured in mm: results are reported as percent of total sample weight in each class.

"L" = "less than".

TABLE 5 (CONTINUED): TRACE METAL AND NUTRIENT CONCENTRATIONS AND PARTICLE SIZE ANALYSES OF SURFACE BED SEDIMENTS IN THE DON RIVER: TAWMS SAMPLING PROGRAM, 1981

Station No.	TAWMS Code	Cd ug/g	Hg ug/g	Cu ug/g	Cr ug/g	Zn ug/g	Pb ug/g	LOI** %	TOC** ug/g	TKN %	T.Phos %	COD ug/g	Clay % L.004	Silt % .004-.06	Sand % .06-.5	Sand % .5-2	Grav. % 2-50
85-003 (abv G.M. Cr)	L0.3	L0.01	5.8	8.5	25.0	11.0	0.6	6200	0.2	0.5*	19000	-	2	42	21	35	
85-015 (Germ. M. Cr)	L0.3	L0.01	5.0	5.0	22.0	3.5	0.6	2700	0.2	0.5*	5200	-	2	56	29	13	
85-017 (Taylor Cr)	L0.3	L0.01	7.2	7.5	30.0	9.0	0.7	3300	0.2	0.3*	16000	-	-	40	57	3	
85-016 (Don V. Pkwy)	0.4	L0.01	6.5	5.8	29.0	11.0	0.7	3000	0.1	0.3*	12000	-	-	42	35	23	
85-001 (Mouth)		0.6	0.08	8.5	9.0	42.0	10.0	0.5	2900	0.2	0.6*	13000	-	-	88	12	-
Guideline		1.0	0.30	25.0	25.0	100.0	50.0	6.0	-	0.2	0.1	50000					

* Indicates that concentration is in excess of suggested guidelines (Persaud and Wilkins, 1976).

** LOI indicates percent loss on ignition (an indication of the organic content of a sediment sample).
TOC indicates total organic carbon content.

"Surface bed sediment" refers to the top 5 cm depth of sediment in the stream bed.

Particle size classes are measured in mm: results are reported as percent of total sample weight in each class.

"L" = "less than".

TABLE 6: NUTRIENTS AND ASSOCIATED PHYSICAL/CHEMICAL PARAMETER CONCENTRATIONS IN SEWAGE TREATMENT PLANT EFFLUENTS:
TAWMS SAMPLING PROGRAM, SEPTEMBER 25 AND OCTOBER 1, 1981.

Plant	Sample Date	Tot. Phos.	Filt. React.	Tot. Kjedl	Filt. Amm. Phos.	NO ₂	NO ₃	Turb. FTU	Hard	Alk.	Phenol	pH S.U.	Temp °C	Cond. umhos	Susp. Solids	Chloride
<u>Humber River:</u>																
Bolton	25/09/81	0.09	0.03	0.95	0.044	0.001	17.000	0.9	225	122	L1	7.9	15.5	1300	0.5	208
	01/10/81	0.19	0.12	1.70	L.002	1.600	19.700	0.6	267	104	1	7.0	16.0	1550	5.7	-
<u>Don River:</u>																
Pugsley	25/09/81	2.21	1.60	9.05	1.08	4.800	15.200	5.7	171	118	1	7.1	15.0	1000	15.1	143
	01/10/81	4.90	4.90	16.10	1.79	8.400	10.85	6.3	175	168	2	7.3	17.0	1050	57.2	-
North Don	25/09/81	2.91	0.20	18.60	10.80	3.850	L.005	5.8	236	251	3	7.4	17.0	1000	27.2	147
	01/10/81	3.49	-	23.80	20.70	0.075	26.400	4.8	184	264	L1	7.4	15.5	1100	53.9	-
John St.	01/10/81*	10.70	7.70	16.90	0.54	0.110	9.140	13.2	204	121	3	7.2	17.0	890	444.0	-
North Toronto	25/09/81	2.91	0.29	24.10	19.00	0.006	0.210	22.0	186	213	24	7.3	19.0	900	60.5	135
	01/10/81	1.36	0.33	19.30	13.80	8.400	29.600	2.9	196	185	10	7.3	17.0	880	160.0	-

- = no data; "L" = "less than".

All results are in mg/L (ppm) unless otherwise specified

* No data were available for the John Street Plant for September 25, 1981.

** The Kleinburg plant is not required to have phosphorus removal to 1 mg/L for its effluent because its design capacity is less than 1 mgd.

Note: High total phosphorus values observed for Don River plants may be misleading. At the time of sampling, these plants were being phased out of operation (see text, page 3) and therefore stocks of phosphorus-removal chemicals were not replenished when exhausted. In most cases, the supplies of chemicals had run out by September 24, 1981. A second problem arises in that the data presented here represent only single grab samples and may differ significantly from the weighted composite samples routinely obtained by plant operators.

TABLE 7: TRACE METAL CONCENTRATIONS IN THE HUMBER
AND DON RIVERS: ROUTINE MONITORING, 1978-1980

Parameter	Station Number			
	Humber River		Don River	
	83-019*	83-001	85-014*	85-001
	(Bloor St.)	(Mouth)	(Pottery Rd)	(Mouth)
LEAD:				
Median:	L30	L30	L30	L30
Maximum:	100	250	180	320
Minimum:	L30	L30	L30	L30
N:	52	48	48	36
% Exceeding Objective of 25 ug/L	28	13	23	22
COPPER:				
Median:	L10	L10	10	20
Maximum:	50	90	60	120
Minimum:	L10	L10	L10	L10
N:	49	46	45	33
% Exceeding Objective of 5 ug/L	22	44	60	55
ZINC:				
Median:	90**	20	150**	40
Maximum:	NA	340	NA	500
Minimum:	NA	L10	NA	L10
N:	1	34	1	36
% Exceeding Objective of 30 ug/L	NA	26	NA	56
CADMIUM:				
Median:	L5.0	L5.0	L5.0	L5.0
Maximum:	50.0	30.0	40.0	13.0
Minimum:	L5.0	L5.0	L5.0	L5.0
N:	52	46	48	33
% Exceeding Objective of 0.2 ug/L	2	11	4	21
MERCURY:				
Median:	0.02	L0.03	0.04	0.04
Maximum:	0.08	0.27	0.45	0.27
Minimum:	L0.02	L0.02	L0.02	L0.02
N:	51	52	48	37
% Less Than Detection Limit of 0.03 ug/' (ppb)	60	36	18	11

L=Less than

*=no 1978 data

**=one sample collected on March 18, 1980

All results are in ug/L (ppb).

TABLE 8: TRACE METAL CONCENTRATIONS IN WATERS OF MIMICO CREEK: TAWMS SAMPLING PROGRAM,
1981

Stn. No. (TAWMS Code)	Sampling Date	Cu	Zn	Cd	Cr ug/L	Pb	Hg
<u>Mimico Creek:</u>							
82-003 (12) (Mouth)	25/09/81 01/10/81	8*	10	L.2	19	L3 120*	L.04 0.06
Objective		5	30	0.2	100	25	

*indicates observed concentration exceeds objective or guideline

- = no data; "L" = "less than".

All results in mg/L unless otherwise indicated.

Low flow sample September 25, 1981

Storm flow sample October 1, 1981

TABLE 8 (CONTINUED): TRACE METAL CONCENTRATIONS IN WATERS OF THE HUMBER RIVER:
TAWMS SAMPLING PROGRAM, 1981

Stn. No. (TAWMS Code)	Sampling Date	Cu	Zn	Cd ug/L	Cr	Pb	Hg
<u>Number River:</u>							
83-018 (6) (u/s Bolton)	25/09/81 01/10/81	2 5	2	L0.2 L0.1	4 2	L3 3	L.06 L.05
83-020 (7) (Hwy. 27)	25/09/81 01/10/81	3 5	1 3	L0.2 0.1	L2 2	L3 L3	L.06 L.05
83-021 (8) (n of Hwy 7)	25/09/81 01/10/81	3 8*	L1 2	L0.2 0.1	L2 2	L3 4	L.04 L.05
83-022 (9) (Albion Rd)	25/09/81 01/10/81	8* 13*	3 55*	0.1 0.7*	3 10	3 36*	L.04 L.05
83-012 (10) (Black Cr)	25/09/81 01/10/81	26* 92*	60* 270*	0.3* 3.4*	22 36	L3 250*	L.04 0.10
83-019 (11) (Bloor St)	25/09/81 01/10/81	5 25*	5 130*	L.2 1.2*	6 17	L3 130*	L.04 0.07
Objective		5	30	0.2	100	25	

*indicates observed concentration exceeds objective or guideline

- = no data; "L" = "less than".

All results in mg/L unless otherwise indicated.

Low flow sample September 25, 1981

Storm flow sample October 1, 1981

TABLE 8 (CONTINUED): TRACE METAL CONCENTRATIONS IN WATERS OF THE DON RIVER:
TAWMS SAMPLING PROGRAM, 1981

Stn. No. (TAWMS Code)	Sampling Date	Cu	Zn	Cd	Cr -----ug/L-----	Pb	Hg
<u>Don River:</u>							
85-003 (1) (abv G.M. Cr)	25/09/81 01/10/81	5 24*	11 120*	L.2 1.1	L2 23	15 100*	L.06 0.16
85-015 (2) (Germ. M. Cr)	25/09/81 01/10/81	11* 96*	28 190*	L.2 12.0*	40 24	L3 87*	L.06 0.06
85-017 (3) (Taylor Cr)	25/09/81 01/10/81	8* 42*	11 170*	L.2 0.9*	8 12	L3 130*	L.04 0.05
85-016 (4) (Don V. Pkwy)	25/09/81 01/10/81	11* 38*	10 150*	L.2 0.6*	30 18	L3 120	L.04 0.05
85-014 (5) (Pottery Rd)	25/09/81 01/10/81	18* 36*	14 140*	L.2 0.6*	11 12	3 140*	L.04 0.08
Objective		5	30	0.2	100	25	

*indicates observed concentration exceeds objective or guideline

- = no data; "L" = "less than".

All results in mg/L unless otherwise indicated.

Low flow sample September 25, 1981

Storm flow sample October 1, 1981

TABLE 9: TRACE METAL CONCENTRATIONS IN SEWAGE TREATMENT PLANT EFFLUENTS:
TAWMS SAMPLING PROGRAM, SEPTEMBER 25 AND OCTOBER 1, 1981.

Plant	Sample Date	Cu	Zn	Cd	Cr	Pb	Hg
		-----	ug/L	-----			
<u>Humber River:</u>							
Bolton	25/09/81	6*	24	0.2	3	3	0.06
	01/10/81	14*	61*	L.1	8	11	L.05
Kleinburg	25/09/81	14*	320*	0.4*	2	9	L.06
	01/10/81	280*	160*	0.7*	12	L3	0.55
<u>Don River:</u>							
Pugsley	25/09/81	110*	120*	0.8*	15	5	L.06
	01/10/81	2400*	250*	2.1*	37	27*	0.06
North Don	25/09/81	45*	67*	0.9*	24	31*	0.12
	01/10/81	54*	100*	0.2	61	210*	0.10
John St.	01/10/81*	380*	350*	2.6*	32	25	0.58
North Toronto	25/09/81	45*	67*	0.9*	24	31*	0.12
	01/10/81	28*	37*	0.3*	12	19	L.05
<u>Objective</u>							
		5	30	0.2	100	25	

- = no data; "L" = "less than".

All results are in mg/L (ppm) unless otherwise specified

* No data were available for the John Street Plant for September 25, 1981.

TABLE 10: TRACE CONTAMINANT CONCENTRATIONS IN WATERS OF THE HUMBER AND DON RIVERS: ROUTINE MONITORING, 1978-80.

Station No.	Humber River			Don River			85-001 (Mouth)
	83-018 (Bolton)	83-019 (Bloor St)	83-001 (Mouth)	85-002 (Sheppard)	85-014 (Pott'y Rd)	85-013 (DVP)	
PCB							
Median	L20	L20	L20	L20	L20	L20	L20
Maximum	L20	230	320	21	570	150	1400
Minimum	L20	L20	L20	L20	L20	L20	L20
N	10	60	52	7	60	15	36
% Exceeding Objective of 1 ng/L (Detection Limit 20 ng/L)							
Median	-	60	L50	-	130	L50	-
Maximum	-	830	320	-	2000	4030	-
Minimum	-	L50	L50	-	L50	L50	-
N	-	38	13	-	33	12	-
(Detection Limit 50 ng/L)							
2,4,5-T							
Median	-	L50	L50	-	L50	L50	-
Maximum	-	300	120	-	110	250	-
Minimum	-	L50	L50	-	L50	L50	-
N	-	36	12	-	33	12	-
(Detection Limit 50 ng/L)							

"-" indicates no data are available; "L" indicates "less than".

All results are in ng/L (ppt).

TABLE 11: PCB/ORGANOCHLORINE PESTICIDE CONCENTRATIONS** IN FILTERED WATER FROM MIMICO CREEK: TAWMS SAMPLING PROGRAM, OCTOBER 1, 1981.

Contaminant	P C B	H C B	H E P	A L	P D	M R	α B	β B	γ B	α C	γ C	O X	O P	P P	P P	D M	T H	T H	T H	H E	D I	E N
82-003(12) (mouth)	13.8*	2.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Detection Limit***	5	.25	.25	.25	.25	.25	.25	.25	.25	.5	.5	.5	.25	.25	.25	1	.5	1	1	.25	.5	1
Objective	1	1	1	(3)	1					10	(-----60-----)	(-----3-----)	40	(-----3-----)			1	1	2			

* results exceed objectives or guidelines for unfiltered water.

ND = not detected

** PP = para para

OP = ortho para

DDE and DDD are metabolites of DDT

Chlor = Chlordane

DMDT = methoxychlor

Thio = Thiodan

Thio S = Thiodan sulphate

Thiodan 1, 2, and S = Endosulfan

Hept Epox = Heptachlor Epoxide

*** note that detection limits are exceptionally low for these TAWMS samples because of very high volume samples.

All results reported as ng/L (ppt).

An objective value in parentheses indicates a concentration which the sum of all related compounds (i.e., DDT and its metabolites or all forms of Chlordane) should not exceed.

TABLE 11 (CONTINUED): PCB/ORGANOCHLORINE PESTICIDE CONCENTRATIONS** IN FILTERED WATER FROM HUMBER RIVER:
TAWMS SAMPLING PROGRAM, OCTOBER 1, 1981.

Contaminant	P C B	H C B	H E P D T A C H L O R	A L D E X C C C R	P D E H C C C R	M I B H C H L O R	α	B	γ	α	γ	O X Y C H C H L O R	O P D D D D T	P P M D T	D H I O 1	T H I O 2	T H I O S	H E P T E R O X	D I E L D R I N	E N D R I N						
83-018(6) (Bolton)	ND	ND	ND	ND	ND	ND	2.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
83-020(7) (Hwy 27)	ND	ND	ND	ND	ND	ND	4.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5	ND	
83-021(8) (n of Hwy 7)	ND	ND	ND	ND	ND	ND	2.0	ND	0.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
83-022(9) (Albion Rd)	ND	ND	ND	ND	ND	ND	3.2	ND	ND	1.5	1.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.5*	ND	
83-012(10) (Black Cr)	7.7*	ND	ND	ND	0.3	ND	49.7	ND	5.7	ND	ND	ND	ND	ND	ND	ND	ND	0.8	ND	ND	0.8	1.5*	ND			
83-019(11) (Bloor St)	8.8*	0.5	ND	ND	ND	ND	42.9	0.7	8.4	0.8	0.6	ND	ND	ND	ND	ND	1.7	1.1	ND	1.6*	2.6*	ND				
Detection Limit***	5	.25	.25	.25	.25	.25	.25	.25	.25	.5	.5	.5	.25	.25	.25	.25	1	.5	1	1	.25	.5	1			
Objective	1		1	1	(3)	1			10	(-----60-----)	(-----3-----)	40	(-----3-----)						1	1	2					

* results exceed objectives or guidelines for unfiltered water.

ND = not detected All results reported as ng/L (ppt).

** PP = para para

OP = ortho para

DDE and DDD are metabolites of DDT

chlor = chlordane

DDMT = methoxychlor

Thio = thiodan

Thio S = Thiodan sulphate

Thiodan 1, 2, and S = Endosulfan

Hept Epox = Heptachlor Epoxide

*** note that detection limits are exceptionally low for these TAWMS samples because of very high volume samples.

An objective value in parentheses indicates a concentration which the sum of all related compounds (i.e., DDT and its metabolites or all forms of chlordane) should not exceed.

TABLE 11 (CONTINUED): PCB/ORGANOCHLORINE PESTICIDE CONCENTRATIONS** IN FILTERED WATER FROM DON RIVER:
TAWMS SAMPLING PROGRAM, OCTOBER 1, 1981.

* results exceed objectives or guidelines for unfiltered water.

ND = not detected All results reported as ng/L (ppt).

** PP = para para

OP = ortho para

DDE and DDD are metabolites of DDT

chlor = chlordane

DMDT = methoxychlor

Thio = thioda

Thio S = Thiodan sulphate

Thiodan 1, 2, and

Hept Epoxy = Heptachlor Epoxide

*** note that detection limits are exceptionally low for these TAWMS samples because of very high volume samples.

An objective value in parentheses indicates a concentration which the sum of all related compounds (i.e., DDT and its metabolites or all forms of chlordane) should not exceed.

TABLE 12: CARBAMATE CONCENTRATIONS IN WATERS OF MIMICO CREEK: TAWMS SAMPLING PROGRAM, OCTOBER 1, 1982

Stn.No. (TAWMS Code)	Carbofuran 3-HO	Propoxur	Carbofuran	Carbaryl IPC	Aminocarb	CIPC	Eptam	Benomyl	Bux	Barban	Butylate	Diallate	Captan
82-003 (12) (Mouth)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Detection Limit*	25	50	25	25	50	50	25	50	100	100	100	50	100

ND = not detected

All results reported as ng/L (ppt)

- = no data

* Note that detection limits are exceptionally low for these TAWMS samples because of very high volume samples.

TABLE 12 (CONTINUED): CARBAMATE CONCENTRATIONS IN WATERS OF THE HUMBER RIVER:
TAWMS SAMPLING PROGRAM, OCTOBER 1, 1982

Stn.No. (TAWMS Code)	Carbofuran 3-HO	Propoxur	Carbofuran	Carbaryl	IPC	Aminocarb	CIPC	Eptam	Benomyl	Bux	Barban	Butylate	Diallate	Captan
83-018 (6) (Bolton)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
83-020 (7) (Hwy 27)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
83-021 (8) (n of Hwy 7)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
83-022 (9) (Albion Rd)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
83-012 (10) (Black Cr)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
83-019 (11) (Bloor St)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Detection Limit*	25	50	25	25	50	50	25	50	50	100	100	100	50	100

ND = not detected

All results reported as ng/L (ppt)

- = no data

* Note that detection limits are exceptionally low for these TAWMS samples because of very high volume samples.

TABLE 12 (CONTINUED): CARBAMATE CONCENTRATIONS IN WATERS OF THE DON RIVER:
TAWMS SAMPLING PROGRAM, OCTOBER 1, 1982

Stn.No. (TAWMS Code)	Carbofuran 3-HO	Propoxur	Carbofuran	Carbaryl	IPC	Aminocarb	CIPC	Eptam	Benomyl	Bux	Barban	Butylate	Diallate	Captan
85-003 (1) (abv G.M. Cr)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
85-015 (2) (Germ.M. Cr)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
85-017 (3) (Taylor Cr)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
85-016 (4) (Don V. Pkwy)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
85-014 (5) (Pottery Rd)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Detection Limit*	25	50	25	25	50	50	25	50	50	100	100	100	50	100

ND = not detected

All results reported as ng/L (ppt)

- = no data

* Note that detection limits are exceptionally low for these TAWMS samples because of very high volume samples.

TABLE 13: ORGANOPHOSPHATE PESTICIDE CONCENTRATIONS IN WATERS OF MIMICO CREEK:
TAWMS SAMPLING PROGRAM, OCTOBER 1, 1981.

Station No.	(TAWMS Code)	Dichlorvos	Phorate	Mevinphos	Diazinon	Ronnel	Parathion	Methyl Parathion	Ethion	Methyl Triithion	Guthion
82-003 (Mouth)	(12)	-	-	-	-	-	-	-	-	-	-
Detection Limit*		.002	.002	.002	.002	.002	.002	.002	.002	.002	.2
Objective				0.08							

- = no data

ND = not detected

All results reported as ug/L (ppb)

* Note that detection limits are exceptionally low for these TAWMS samples because of very high volume samples.

TABLE 13 (CONTINUED): ORGANOPHOSPHATE PESTICIDE CONCENTRATIONS IN WATERS OF HUMBER RIVER:
TAWMS SAMPLING PROGRAM, OCTOBER 1, 1981.

Station No.	(TAWMS Code)	Dichlorvos	Phorate	Mevinphos	Diazinon	Ronnel	Parathion	Methyl Parathion	Ethion	Methyl Trithion	Guthion
83-018 (Bolton)	(6)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
83-020 (Hwy 27)	(7)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
83-021 (n of Hwy 7)	(8)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
83-022 (Albion Rd)	(9)	ND	ND	ND	0.004	ND	ND	ND	ND	ND	ND
83-012 (Black Cr)	(10)	ND	ND	ND	0.004	ND	ND	ND	ND	ND	ND
83-019 (Bloor St)	(11)	ND	ND	ND	0.007	ND	ND	ND	ND	ND	ND
Detection Limit*		.002	.002	.002	.002	.002	.002	.002	.002	.002	.2
Objective					0.08						

- = no data

ND = not detected

All results reported as ug/L (ppb)

* Note that detection limits are exceptionally low for these TAWMS samples because of very high volume samples.

TABLE 13 (CONTINUED): ORGANOPHOSPHATE PESTICIDE CONCENTRATIONS IN WATERS OF DON RIVER:
TAWMS SAMPLING PROGRAM, OCTOBER 1, 1981.

Station No.	(TAWMS Code)	Dichlorvos	Phorate	Mevinphos	Diazinon	Ronnel	Parathion	Methyl Parathion	Ethion	Methyl Trithion	Guthion
85-003 (abv G.M. Cr)	(1)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
85-015 (Germ. M. Cr)	(2)	ND	ND	ND	0.030	ND	ND	ND	ND	ND	ND
85-017 (Taylor Cr)	(3)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
85-016 (Don V. Pkwy)	(4)	-	-	-	-	-	-	-	-	-	-
85-014 (Pottery Rd)	(5)	ND	ND	ND	0.007	ND	ND	ND	ND	ND	ND
Detection Limit*		.002	.002	.002	.002	.002	.002	.002	.002	.002	.2
Objective				0.08							

- = no data

ND = not detected

All results reported as ug/L (ppb)

* Note that detection limits are exceptionally low for these TAWMS samples because of very high volume samples.

TABLE 14: TRIAZINE HERBICIDE CONCENTRATIONS IN WATERS OF MIMICO CREEK: TAWMS SAMPLING PROGRAM, OCTOBER 1, 1981.

Station Number (TAWMS Code)	Propazine	Atrazine	Simazine	Sencor	Bladex	Prometone	Ametryne	Prometryne
82-003 (12) (mouth)	-	-	-	-	-	-	-	-
Detection Limit*	.01	.01	.01	.025	.005	.01	.01	.01
Objective		10						

- = no data

ND = not detected

All results reported as ug/L (ppb)

* Note that detection limits are exceptionally low for these TAWMS samples because of very high volume samples.

TABLE 14 (CONTINUED): TRIAZINE HERBICIDE CONCENTRATIONS IN WATERS OF THE HUMBER RIVER: TAWMS SAMPLING PROGRAM, OCTOBER 1, 1981.

Station Number (TAWMS Code)	Propazine	Atrazine	Simazine	Sencor	Bladex	Prometone	Ametryne	Prometryne
83-018 (6) (Bolton)	ND	ND	ND	ND	ND	ND	ND	ND
83-020 (7) (Hwy 27)	ND	ND	ND	ND	ND	ND	ND	ND
83-021 (8) (N of Hwy 7)	ND	ND	ND	ND	ND	ND	ND	ND
83-022 (9) (Albion Rd)	ND	0.23	ND	ND	ND	ND	ND	ND
83-012 (10) (Black Cr)	ND	0.07	4.4	ND	ND	ND	ND	ND
83-019 (11) (Bloor St)	ND	ND	1.3	ND	ND	ND	ND	ND
Detection Limit*	.01	.01	.01	.025	.005	.01	.01	.01
Objective			10					

- = no data

ND = not detected

All results reported as ug/L (ppb)

* Note that detection limits are exceptionally low for these TAWMS samples because of very high volume samples.

TABLE 14 (CONTINUED): TRIAZINE HERBICIDE CONCENTRATIONS IN WATERS OF THE DON RIVER: TAWMS SAMPLING PROGRAM, OCTOBER 1, 1981.

Station Number (TAWMS Code)	Propazine	Atrazine	Simazine	Sencor	Bladex	Prometone	Ametryne	Prometryne
85-003 (1) (abv G.M. Cr)	ND	0.35	ND	ND	ND	ND	ND	ND
85-015 (2) (Germ. M. Cr)	ND	0.09	ND	ND	ND	ND	ND	ND
85-017 (3) (Taylor Cr)	ND	ND	ND	ND	ND	ND	ND	ND
85-016 (4) (Don V. Pkwy)	-	-	-	-	-	-	-	-
85-014 (5) (Pottery Rd)	ND	0.06	ND	ND	ND	ND	ND	ND
Detection Limit*	.01	.01	.01	.025	.005	.01	.01	.01
Objective		10						

- = no data

ND = not detected

All results reported as ug/L (ppb)

* Note that detection limits are exceptionally low for these TAWMS samples because of very high volume samples.

TABLE 15: CHLOROPHOXY/CHLOROBENZOIC ACID HERBICIDE CONCENTRATIONS IN WATERS OF MIMICO CREEK: TAWMS SAMPLING PROGRAM, OCTOBER 1, 1981

Station Number	(TAWMS Code)	Dicamba	2,4-DP	2,4-D	Silvex	2,4-DB	Pichloram	2,4,6-T	2,4,5-T	2,3,4-T	2,3,5,6-T	2,3,4,5-T	PCP
82-003 (mouth)	(12)	-	-	-	-	-	-	-	-	-	-	-	-
Detection Limit**		0.025	0.025	0.025	0.01	0.01	0.025	0.01	0.01	0.02	0.01	0.01	0.01
Objective		200		4.									0.4

- = no data

ND = not detected.

* = observed concentration exceeds objective.

All data reported as ug/L (ppb).

**Note that detection limits are exceptionally low for these TAWMS samples because of very high volume samples.

TABLE 15 (CONTINUED): CHLOROPHENOX/CHLOROBENZOIC ACID HERBICIDE CONCENTRATIONS IN WATERS OF THE HUMBER RIVER:
TAWMS SAMPLING PROGRAM, OCTOBER 1, 1981.

Station Number	(TAWMS Code)	Dicamba	2,4-DP	2,4-D	Silvex	2,4-DB	Pichloram	2,4,6-T	2,4,5-T	2,3,4-T	2,3,5,6-T	2,3,4,5-T	PCP
83-018 (Bolton)	(6)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
83-020 (Hwy 27)	(7)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
83-021 (n of Hwy 7)	(8)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
83-022 (Albion Rd)	(9)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10
83-012 (Black Cr)	(10)	ND	0.18	0.18	ND	ND	ND	ND	ND	ND	ND	ND	0.70*
83-019 (Bloor St)	(11)	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.03	ND	0.52*
Detection Limit**		0.025	0.025	0.025	0.01	0.01	0.025	0.01	0.01	0.02	0.01	0.01	0.01
Objective		200		4.									0.4

- = no data

ND = not detected.

* = observed concentration exceeds objective.

All data reported as ug/L (ppb).

** Note that detection limits are exceptionally low for these TAWMS samples because of very high volume samples.

TABLE 15 (CONTINUED): CHLOROPHENOXY/CHLOROBENZOIC ACID HERBICIDE CONCENTRATIONS IN WATERS OF THE DON RIVER:
TAWMS SAMPLING PROGRAM, OCTOBER 1, 1981.

Station Number	(TAWMS Code)	Dicamba	2,4-DP	2,4-D	Silvex	2,4-DB	Pichloram	2,4,6-T	2,4,5-T	2,3,4-T	2,3,5,6-T	2,3,4,5-T	PCP
85-003	(1) (abv G.M. Cr)	0.06	0.18	1.13	ND	ND	ND	ND	ND	ND	0.06	ND	2.0*
85-015	(2) (Germ. M. Cr)	0.39	1.13	18.0*	ND	ND	ND	ND	ND	ND	ND	ND	0.09
85-017	(3) (Taylor Cr)	ND	0.2	0.05	ND	ND	ND	ND	ND	ND	ND	ND	0.45*
85-016	(4) (Don V. Pkwy)	-	-	-	-	-	-	-	-	-	-	-	-
85-014	(5) (Pottery Rd)	0.03	0.27	0.05	ND	ND	ND	ND	ND	ND	ND	ND	0.20
Detection Limit**		0.025	0.025	0.025	0.01	0.01	0.025	0.01	0.01	0.02	0.01	0.01	0.01
Objective		200	4.										0.4

- = no data

ND = not detected.

* = observed concentration exceeds objective.

All data reported as ug/L (ppb).

** Note that detection limits are exceptionally low for these TAWMS samples because of very high volume samples.

TABLE 16: PCB/ORGANOCHLORINE PESTICIDE CONCENTRATIONS** IN SURFACE BED SEDIMENTS FROM THE HUMBER AND DON RIVERS: ROUTINE MONITORING, 1980

Contaminant	P	H	H	A	P	M	α	β	γ	α	γ	O	O	P	P	D	T	T	T	H	D	E
	C	C	E	L	P	I		B	B	C	C	X	P	P	P	M	H	H	H	E	I	N
	B	B	P	D	R	B		H	H	H	H			D	D	D	I	I	I	P	E	D
	T	R	D	E	H	H		H	H	H	H			D	D	D	T	0	0	T	L	R
	A	I	D	X	C	C		C	C	L	L	C	D	D	D	D	T	1	2	S	D	I
	C	N	E					O	O	H	H	D	D	D	D	T			E	R	N	
Station (Year)	H							R	R	L	R	L					O		P	I	N	
Number	L	O	R									R					O	X				
Humber River:																						
83-001 (1980) (Mouth)	264*	ND	ND	4	ND	2	ND	-	11	16	-	6	13	ND	-	3	ND	-	5	ND	ND	
Don River:																						
85-001 (1980) (mouth)	95*	ND	ND	3	ND	15	ND	-	31	41	-	10	38	ND	-	ND	ND	-	13	6	ND	
Detection Limit	20	1	1	1	1	5	1	1	1	2	2	2	5	5	5	4	2	4	4	1	2	4
Guideline	50																					

* Results exceed MOE guidelines for the open water disposal of dredged material (Persaud and Wilkins, 1976).

** ND = not detected

"-" = no data

All results reported as ug/kg (ppb)

PP = para para

OP = ortho para

DDE and DDD are metabolites of DDT

Chlor = Chlordane

DMDT = methoxychlor

Thio = Thiodan

Thio S = Thiodan sulphate

Thiodan 1, 2, and S = Endosulfan

Hept Epox = Heptachlor Epoxide

An objective value in parentheses indicates a concentration which the sum of all related compounds (i.e., DDT and its metabolites or all forms of Chlordane) should not exceed.

TABLE 17: PCB/ORGANOCHLORINE PESTICIDE CONCENTRATIONS** IN SURFACE BED SEDIMENTS OF MIMICO CREEK:
TAWMS SAMPLING PROGRAM, 1981.

Contaminant	P C B	H C B	H E P	A L D	P I R	M B B	α B H	β B H	γ B H	α C H	γ C H	O X Y	O P D	P P D	P P D	D M T	T H O	T H O	T H O	H E P	D I T	E N D R I N
Stn. TAWMS No. Code																						
82-003(12) (mouth)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1	ND	ND							
Detection Limit	20	1	1	1	1	5	1	1	1	2	2	2	5	5	5	4	2	4	4	1	2	4
Guideline	50																					

ND = not detected

All results are reported as ng/g (ppb)

* Exceeds MOE guidelines for the open water disposal of dredged material (Persaud and Wilkins, 1976)

** PP = para para

OP = ortho para

DDE and DDD are metabolites of DDT

Chlor = Chlordane

DMDT = methoxychlor

Thio = Thiodan

Thio S = Thiodan sulphate

Thiodan 1, 2, and S = Endosulfan

Hept Epox = Heptachlor Epoxide

"Surface bed sediment" refers to the top 5 cm depth of sediment in the stream bed.

TABLE 17 (CONTINUED): PCB/ORGANOCHLORINE PESTICIDE CONCENTRATIONS** IN SURFACE BED SEDIMENTS OF THE HUMBER RIVER:
TAWMS SAMPLING PROGRAM, 1981.

Contaminant	P C B	H C B	H E P	A L D	P I R	M B H	α B E	β B H	Y B H	α C C	Y C H	O X Y	O P D	P P D	P P D	D M D	T H T	T H H	T H I	H E P	D I T	E N D
Stn. TAWMS No. Code																						
83-018 (6) (Bolton)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND							
83-020 (7) (Hwy 27)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5	ND	ND	ND							
83-021 (8) (n of Hwy 7)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6	ND	ND	ND							
83-022 (9) (Albion Rd)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4	5	1	ND							
83-012(10) (Black Cr)	25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
83-001 (Mouth)	360*	ND	ND	ND	ND	ND	1	ND	1	8	8	ND	ND	6	6	ND	2	ND	ND	1	ND	
Detection Limit	20	1	1	1	1	5	1	1	1	2	2	2	5	5	5	4	2	4	4	1	2	
Guideline	50																					

ND = not detected

All results are reported as ng/g (ppb)

* Exceeds MOE guidelines for the open water disposal of dredged material (Persaud and Wilkins, 1976)

** PP = para para

OP = ortho para

DDE and DDD are metabolites of DDT

Chlor = Chlordane

DMDT = methoxychlor

Thio = Thiodan

Thio S = Thiodan sulphate

Thiodan 1, 2, and S = Endosulfan

Hept Epox = Heptachlor Epoxide

"Surface bed sediment" refers to the top 5 cm depth of sediment in the stream bed.

TABLE 17 (CONTINUED): PCB/ORGANOCHLORINE PESTICIDE CONCENTRATIONS** IN SURFACE BED SEDIMENTS OF THE DON RIVER:
TAWMS SAMPLING PROGRAM, 1981.

Contaminant	P C B	H C B	H E P	A L D	P I E	M R D	α B E	β B H	γ B H	α C H	γ C H	O X Y	O P D	P P D	P P D	D M T	T H O	T H O	T H O	H E P	D I T	E N D R
Stn. TAWMS No. Code																						
85-003 (1) (abv G.M. Cr)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND							
85-015 (2) (Germ. M. Cr)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5	ND	ND	ND	ND							
85-017 (3) (Taylor Cr)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3	ND	ND	ND							
85-016 (4) (Don V. Pkwy)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND							
85-001 (Mouth)	25	ND	ND	ND	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Detection Limit	20	1	1	1	1	5	1	1	1	2	2	2	5	5	5	4	2	4	4	1	2	4
Guideline	50																					

ND = not detected

All results are reported as ng/g (ppb)

* Exceeds MOE guidelines for the open water disposal of dredged material (Persaud and Wilkins, 1976)

** PP = para para

OP = ortho para

DDE and DDD are metabolites of DDT

Chlor = Chlordane

DMDT = methoxychlor

Thio = Thiodan

Thio S = Thiodan sulphate

Thiodan 1, 2, and S = Endosulfan

Hept Epox = Heptachlor Epoxide

"Surface bed sediment" refers to the top 5 cm depth of sediment in the stream bed.

TABLE 18: PCB/ORGANOCHLORINE PESTICIDE RESIDUE CONCENTRATIONS* IN FRESHWATER CLAMS (ELLIPTIO COMPLANATUS) AFTER 21 DAYS EXPOSURE IN MIMICO CREEK:
TAWNS SAMPLING PROGRAM, 1981

Contaminant	P C B	H C B	H E P	A L D	P I R	M B	α	β	γ	α	γ	O X Y	O P D	P P D	P P D	D M D	T H I	T H I	T H I	H E P T	D I E L	E N D R I N O X
82-003 (12) (Mouth)	64+6	ND	ND	ND	ND	ND	ND	ND	ND	5 ± 2	7 ± 5	4 ± 3	ND	3 ± 3	ND	ND						
Control (Balsam Lake)	ND	ND	ND	ND	3 ± 4	ND	ND	ND	ND	ND	ND	ND	ND	5+4	ND	ND	ND	ND	ND	ND	ND	ND
Detection Limit	20	1	1	1	1	5	1	1	1	2	2	2	5	5	5	4	2	4	4	1	2	4

All results are mean ± standard deviation in ng/g (ppb).

* PP = para para
Chlor = Chlordane
Thio S = Thiodan sulphate
ND = not detected

OP = ortho para
DMDT = methoxychlor
Thiodan 1, 2, and S = Endosulfan
"--" = no data

DDE and DDD are metabolites of DDT
Thio = Thiodan
Hept Epox = Heptachlor Epoxide

TABLE 18 (CONTINUED): PCB/ORGANOCHLORINE PESTICIDE RESIDUE CONCENTRATIONS* IN FRESHWATER CLAMS (ELLIPTIO COMPLANATUS) AFTER 21 DAYS EXPOSURE IN HUMBER RIVER: TAWMS SAMPLING PROGRAM, 1981

Contaminant	P C B	H C B	H E P T A I R L D N X C C H C H O R	M I R E H C C H L O R	α B B C C H L O R	β B B C C H L O R	γ B B C C H L O R	α C C H L O R	γ C C H L O R	O X Y C H L O R	O P D D D D T	P P M D T	D T	T H I O	T H I O	T H I O	H E P T	D I E L D R I N	E N D R I N
83-018 (6) (Bolton)	ND	ND	ND	ND	3 ± 3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
83-020 (7) (Hwy 27)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
83-021 (8) (n of Hwy 7)	ND	ND	ND	ND	1 ± 0	ND	1 ± 1	ND	ND	ND	2 ± 2	ND	ND	ND	ND	ND	ND	ND	3 ± 3
83-022 (9) (Albion Rd)	37 ± 13	ND	ND	ND	3 ± 5	ND	ND	ND	ND	2 ± 1	3 ± 2	ND	ND	ND	ND	ND	ND	ND	4 ± 1
83-012 (10) (Black Cr)	56 ± 30	ND	ND	ND	2 ± 2	ND	ND	ND	29 ± 30	41 ± 29	2 ± 2	ND	ND	ND	ND	2 ± 1	ND	1 ± 0	ND
83-001 (Mouth)	63 ± 14	ND	ND	ND	ND	ND	4 ± 2	ND	8 ± 1	1 ± 0	ND	1 ± 1	ND	ND	ND	ND	ND	1 ± 1	2 ± 1
Control (Balsam Lake)	ND	ND	ND	ND	3 ± 4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Detection Limit	20	1	1	1	1	5	1	1	1	2	2	2	5	5	5	4	2	4	4

All results are mean ± standard deviation in ng/g (ppb).

* PP = para para

OP = ortho para

DDE and DDD are metabolites of DDT

Chlor = Chlordane

DMDT = methoxychlor

Thio = Thiodan

Thio S = Thiodan sulphate

Thiodan 1, 2, and S = Endosulfan

Hept Epox = Heptachlor Epoxide

ND = not detected

"-" = no data

TABLE 18 (CONTINUED): PCB/ORGANOCHLORINE PESTICIDE RESIDUE CONCENTRATIONS* IN FRESHWATER CLAMS (ELLIPTIO COMPLANATUS) AFTER 21 DAYS EXPOSURE IN THE DON RIVER: TAWMS SAMPLING PROGRAM, 1981

Contaminant	P C B	H C B	H E P T A C R I N	A L D R I N	P P D E X	M I R E X	α B H C	β B H C	γ B H C	α C H L O R	γ C H L O R	δ X Y C H L O R	O P D D D D	O P D D D D	P P D D D D	P P D D D T	D M D T 1	T H I O 2	T H I O S	H E P T E P O X	D I E L D R I N	E N D R I N
85-003 (1) (abv G.M. Cr)	23+2	1+1	ND	ND	2+1	ND	25+13	ND	9+2	14+4	8+2	ND	ND	ND	ND	ND	ND	ND	ND	3+1	2+1	ND
85-015 (2) (Germ.M. Cr)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
85-017 (3) (Taylor Cr)	18+7	ND	ND	ND	ND	ND	ND	ND	ND	5+3	6+5	3+3	ND	ND	ND	ND	ND	ND	ND	ND	3+2	ND
85-016 (4) (Don V. Pkwy)	26+6	ND	ND	ND	1+0	ND	ND	ND	ND	3+1	2+2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
85-001 (Mouth)	ND	1+1	ND	ND	1+1	ND	ND	ND	3+3	2+1	1+1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Control (Balsam Lake)	ND	ND	ND	ND	3+4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Detection Limit	20	1	1	1	1	5	1	1	1	2	2	2	5	5	5	4	2	4	4	1	2	4

All results are mean \pm standard deviation in ng/g (ppb).

- ★ PP = para para
- Chlor = Chlordane
- Thio S = Thiadan sulphate
- ND = not detected

OP = ortho para

DMDT = methoxychlor

Thiodan 1, 2, and S

"—" = no data

-- = no data

DDE and DDD are metabolites of DDT

Thio = Thiordan

Hept Epx = Heptachlor Epoxide

TABLE 19: PCB/ORGANOCHLORINE RESIDUES IN YOUNG-OF-THE-YEAR FISH SPECIES COLLECTED FROM THE DON RIVER, HUMBER RIVER, AND MIMICO CREEK, 1981

Location (Stn. No.)	Species	*No. of Samples	**Fish Length (mm)	% Lipids	PCB ng/g	Σ DDT ng/g	Σ BHC ng/g	Σ Chlordane ng/g
<u>Don River</u>								
Don Above Taylor Creek (F10)	Longnose Dace	5	40 ± 3	3.4 ± 0.4	208 ± 39	85 ± 17	26 ± 33	58 ± 10
Taylor Creek (F9)	Longnose Dace	5	44 ± 3	6.2 ± 0.6	523 ± 42	141 ± 28	679 ± 60	65 ± 8
Don/W. Don Confluence (F8)	Longnose Dace	5	47 ± 3	5.5 ± 0.4	501 ± 48	122 ± 36	17 ± 8	48 ± 3
Don at Pottery Road (F7)	Longnose Dace	5	46 ± 4	7.4 ± 0.9	372 ± 149	86 ± 33	36 ± 22	57 ± 21
Don Below Bloor Street (F6)	Longnose Dace	5	46 ± 3	7.0 ± 0.7	440 ± 64	69 ± 20	56 ± 17	68 ± 5
<u>Humber River</u>								
Finch Avenue (F5)	Common Shiners	3	57 ± 6	3.8 ± 0.5	160 ± 37	20 ± 3	6 ± 2	11 ± 7
Scarlett Road (F4)	Common Shiners	4	59 ± 3	5.7 ± 0.3	2282 ± 184	15 ± 12	6 ± 2	9 ± 2
Black Creek (F3)	Common Shiners	4	55 ± 3	6.1 ± 0.2	1106 ± 195	30 ± 25	9 ± 2	12 ± 2
River Valley Cres.(F2)	Common Shiners	5	56 ± 3	3.4 ± 0.3	1054 ± 101	65 ± 21	17 ± 8	14 ± 1
Humber River Mouth (F1)	Spottail Shiners	6	62 ± 5	5.0 ± 0.8	954 ± 45	85 ± 41	10 ± 2	26 ± 9
<u>Mimico Creek</u>								
Mimico Creek Mouth (F11)	Spottail Shiners	5	68 ± 4	6.4 ± 0.2	1051 ± 105	137 ± 18	19 ± 2	47 ± 3

* Composites of 10 fish each

** Total Length

Mean of samples shown ± 1 standard deviation in ng/g (ppb).

Note that several species of fish are represented in these data. Caution must be used in comparing data from one species to another until differences (if any) in the bioaccumulation mechanisms of the species are better understood.

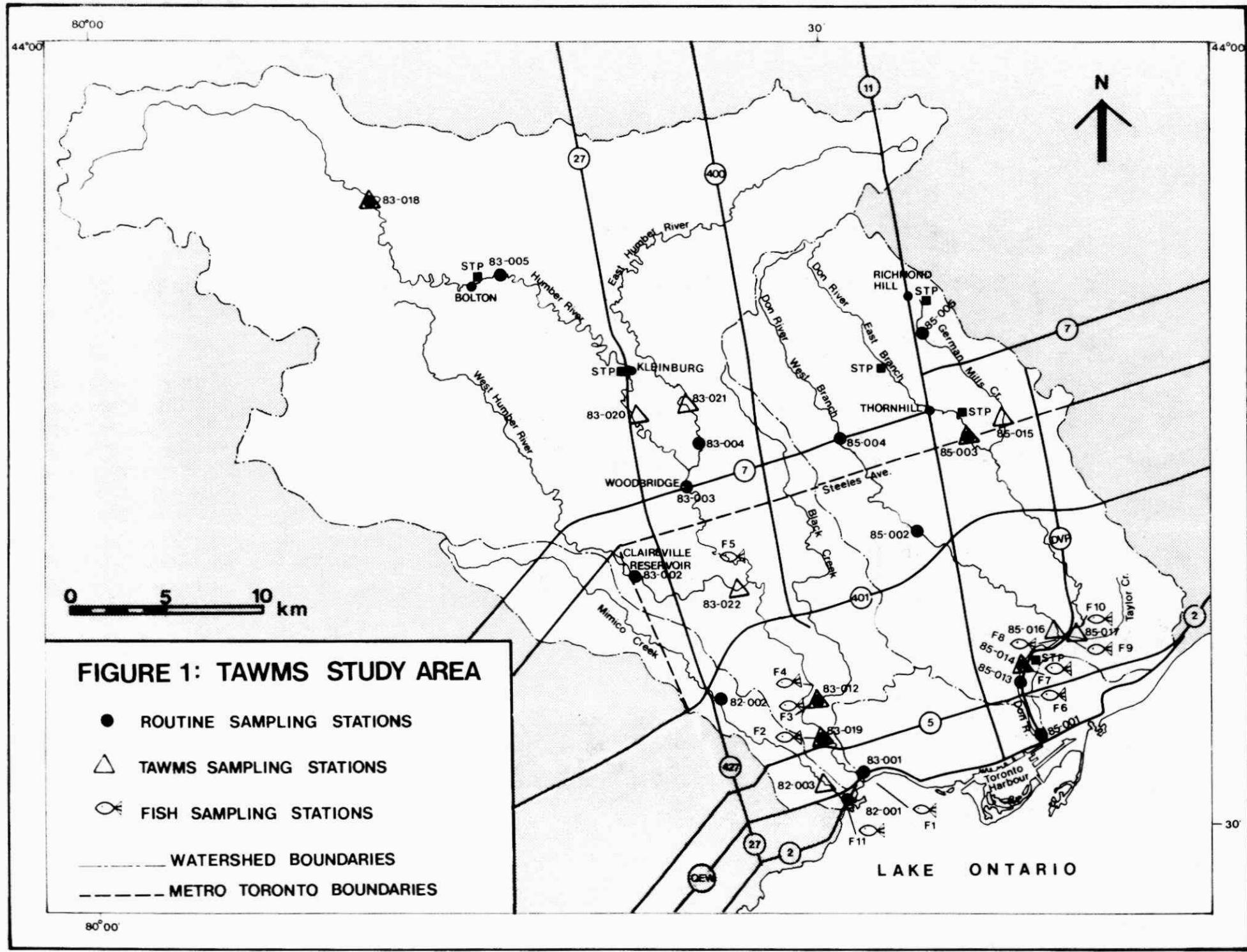
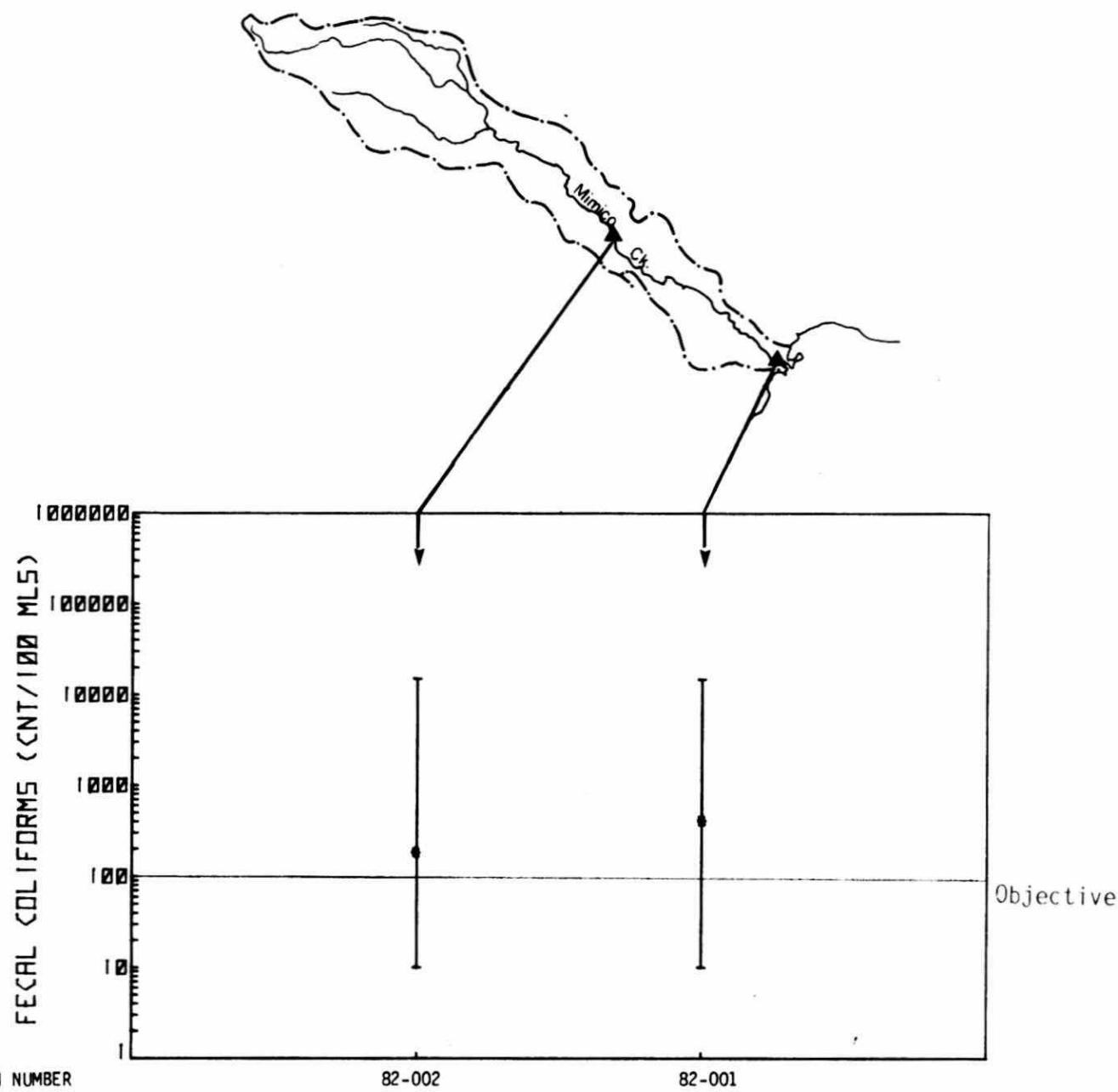


FIGURE 1: TAWMS STUDY AREA

- ROUTINE SAMPLING STATIONS
- △ TAWMS SAMPLING STATIONS
- FISH SAMPLING STATIONS
- WATERSHED BOUNDARIES
- - - METRO TORONTO BOUNDARIES

80°00'

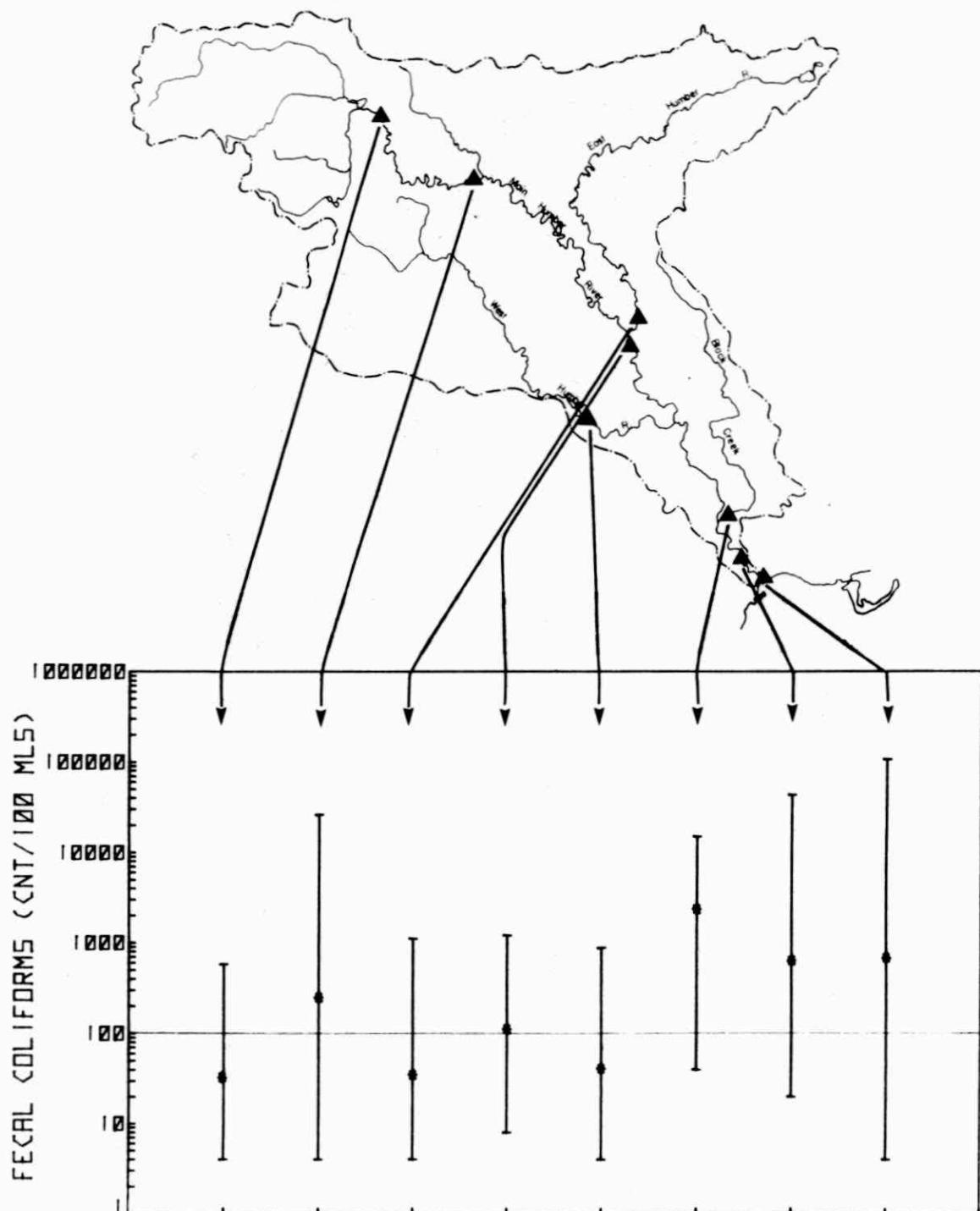
LAKE ONTARIO



Geometric Mean	196	409
Maximum	14997	14791
Minimum	10	10
N	27	27
% Exceeding Objective	56	78

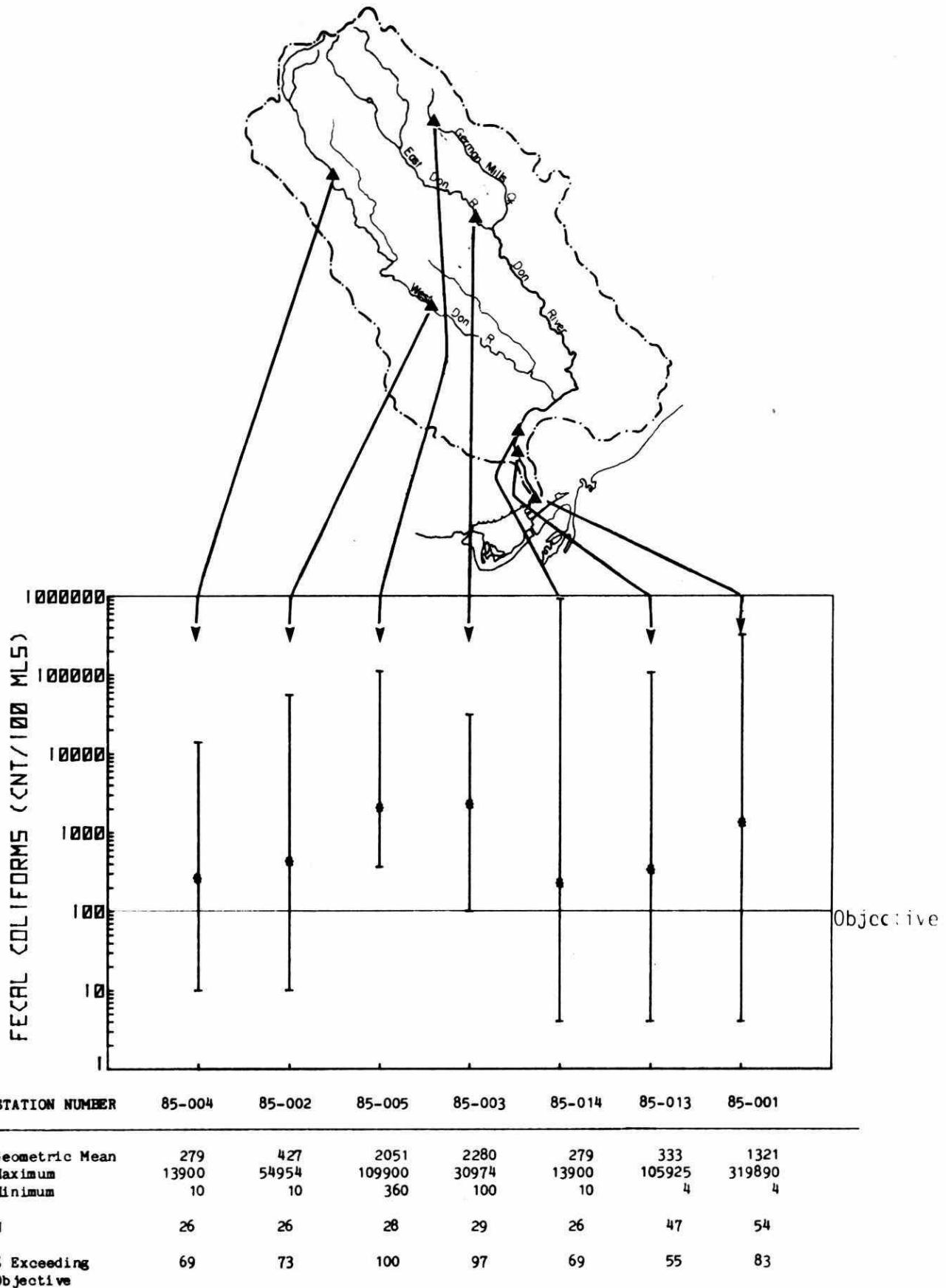
Note: * = geometric mean shown with maximum-minimum range

FIGURE 2. Fecal Coliforms (cnt/100 mls) in Mimico Creek, 1978-80.



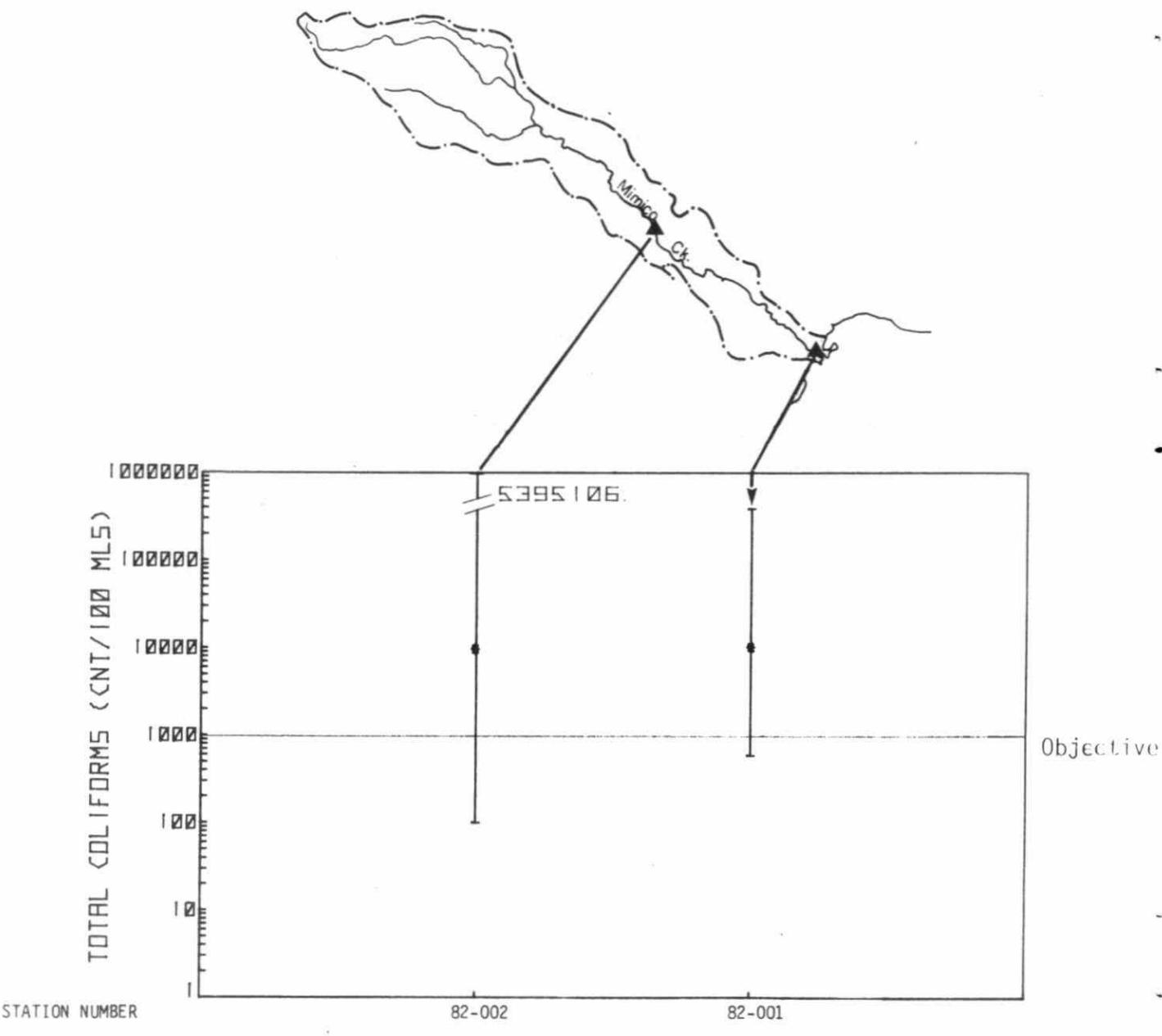
Note: * = geometric mean shown with maximum-minimum range

FIGURE 3. Fecal Coliforms (cnt/100 mls) in the Humber River, 1978-80.



Note: * = geometric mean shown with maximum-minimum range

FIGURE 4. Fecal Coliforms (cnt/100 mls) in the Don River, 1978-80.



Geometric Mean
Maximum
Minimum

10280
5395106
100

10209
389942
590

N

27

27

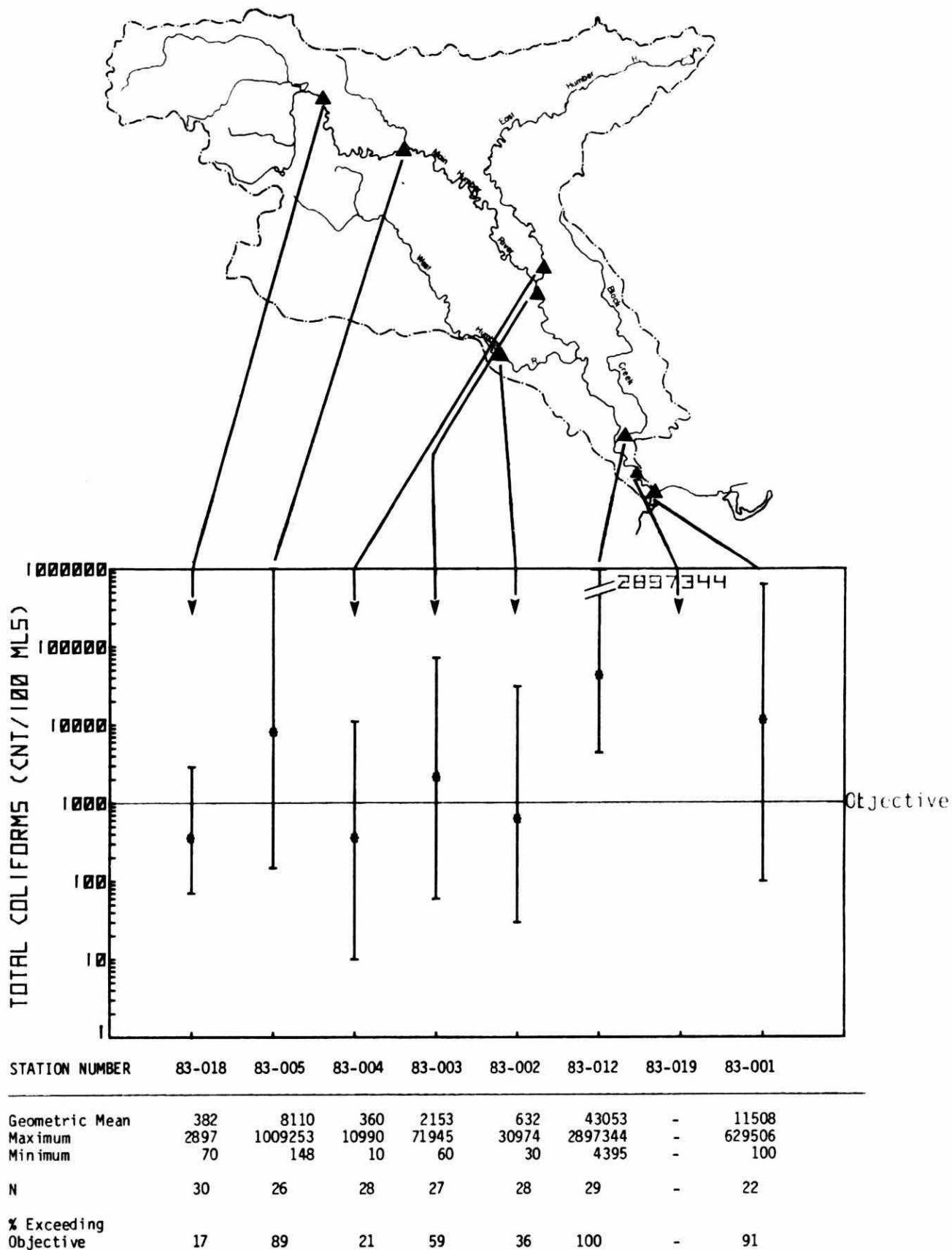
% Exceeding
Objective

90

82

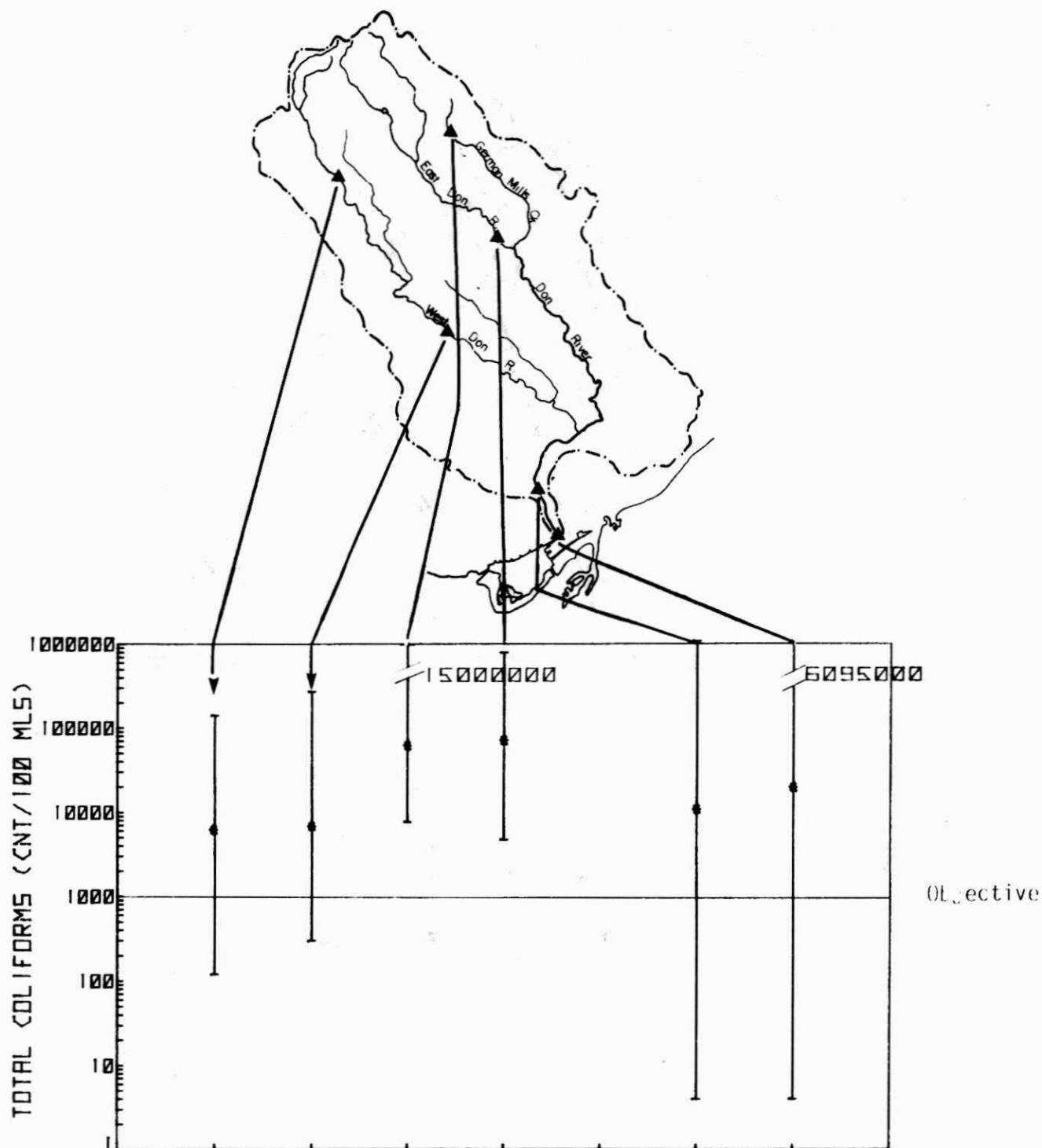
Note: * = geometric mean shown with maximum-minimum range

FIGURE 5. Total Coliforms (cnt/100 mls) in Mimico Creek, 1978-80.



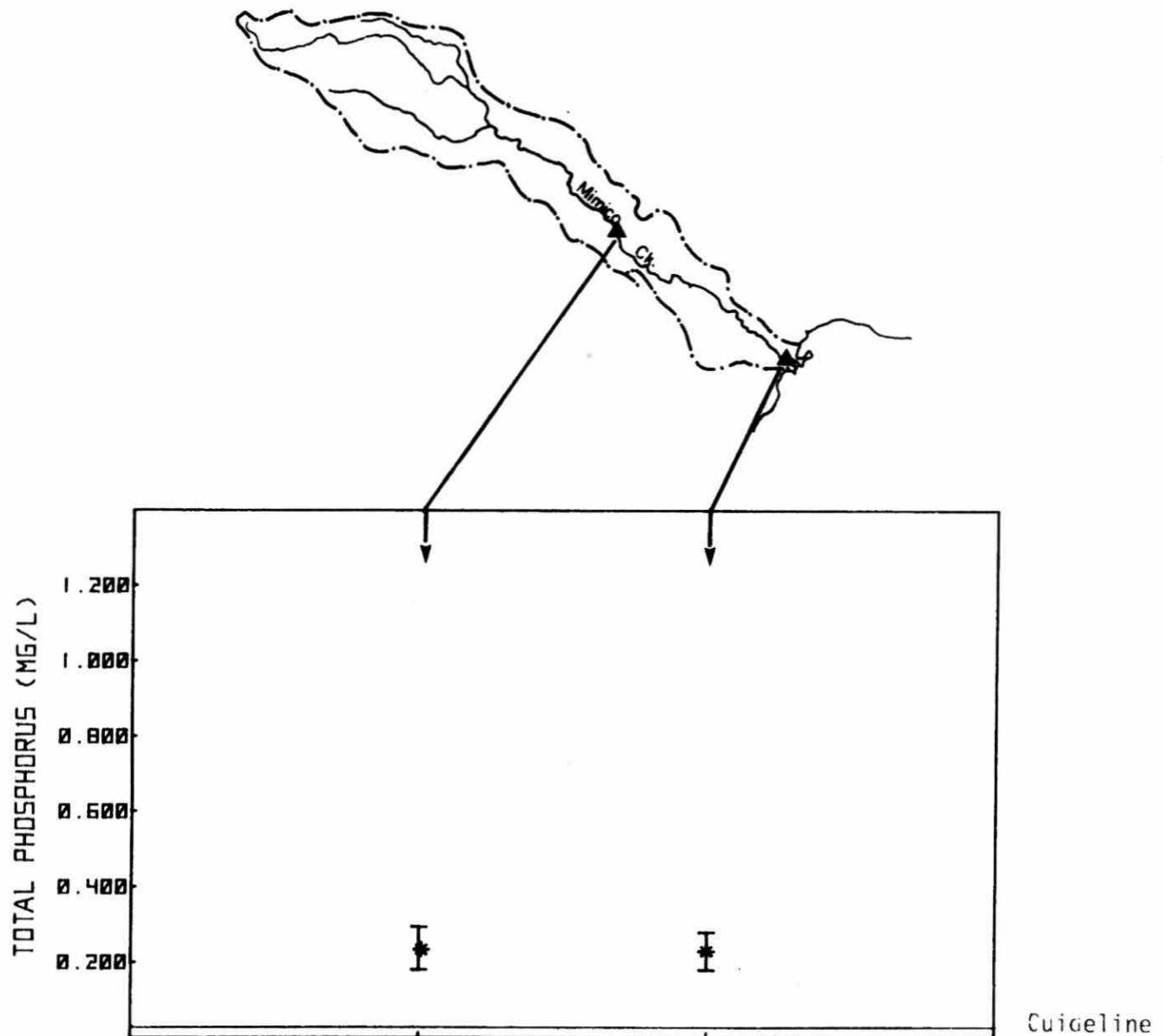
Note: * = geometric mean shown with maximum-minimum range

FIGURE 6. Total Coliforms (cnt/100 mls) in the Humber River, 1978-80.



Note: * = geometric mean shown with maximum-minimum range

FIGURE 7. Total Coliforms (cnt/100 mls) in the Don River, 1978-80.



STATION NUMBER	82-002	82-001
Mean	0.238	0.231
Maximum	1.320	1.150
Minimum	0.022	0.029
Std. Deviation	0.284	0.260
N	25	27
% Exceeding Objective	96	96

Note: * = mean shown with standard error

FIGURE 8. Total Phosphorus (mg/L) in Mimico Creek, 1978-80.

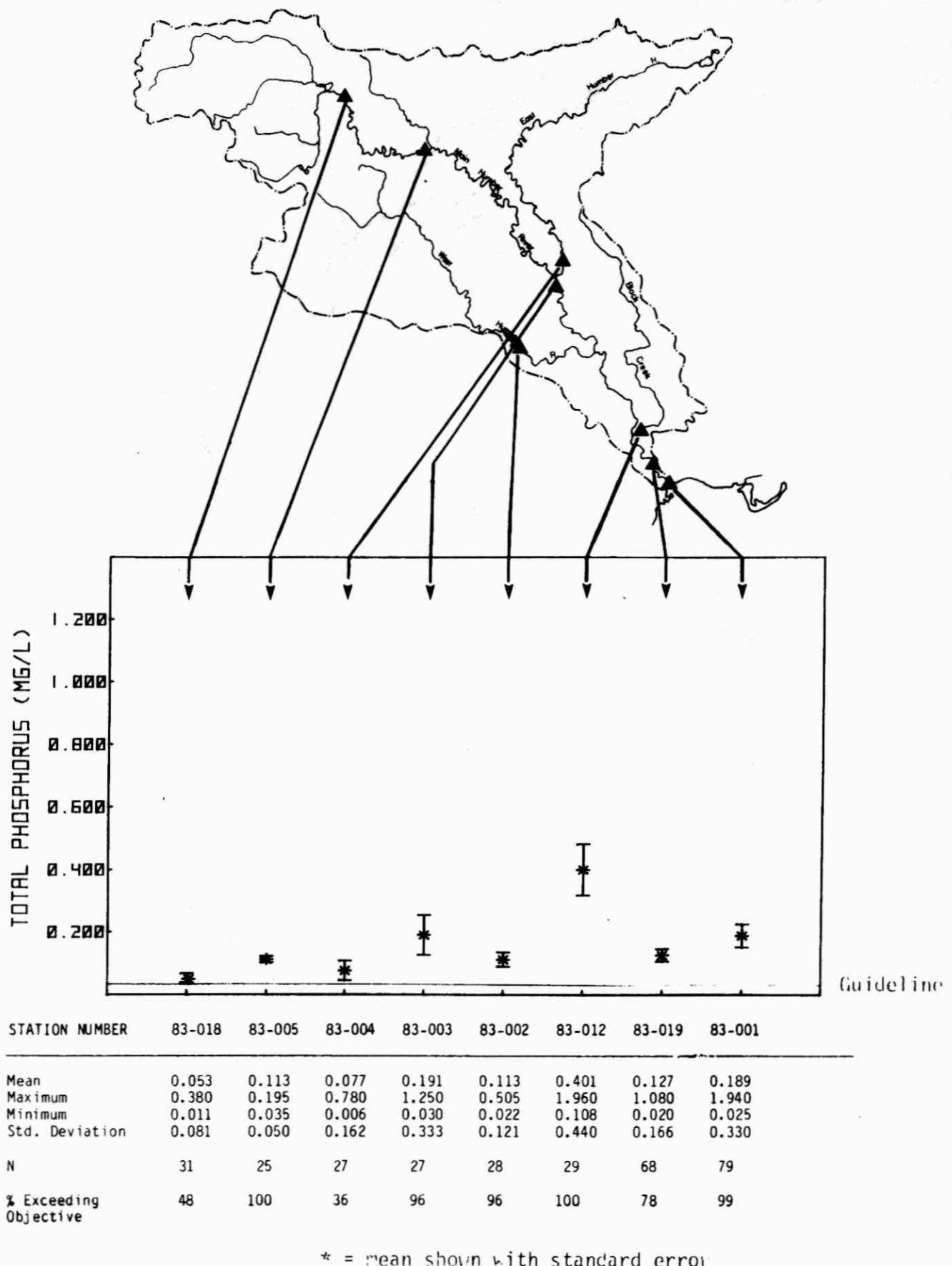
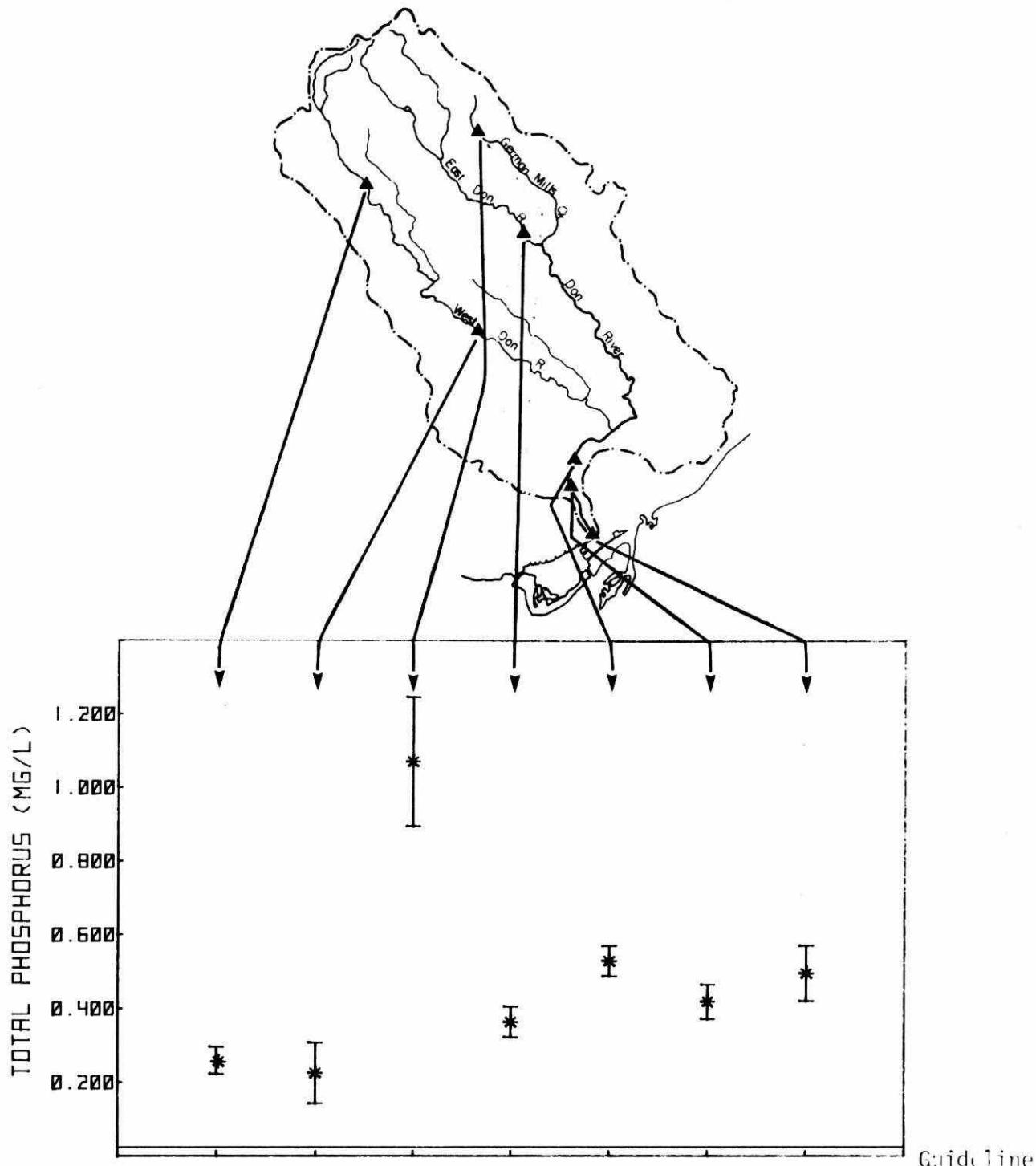
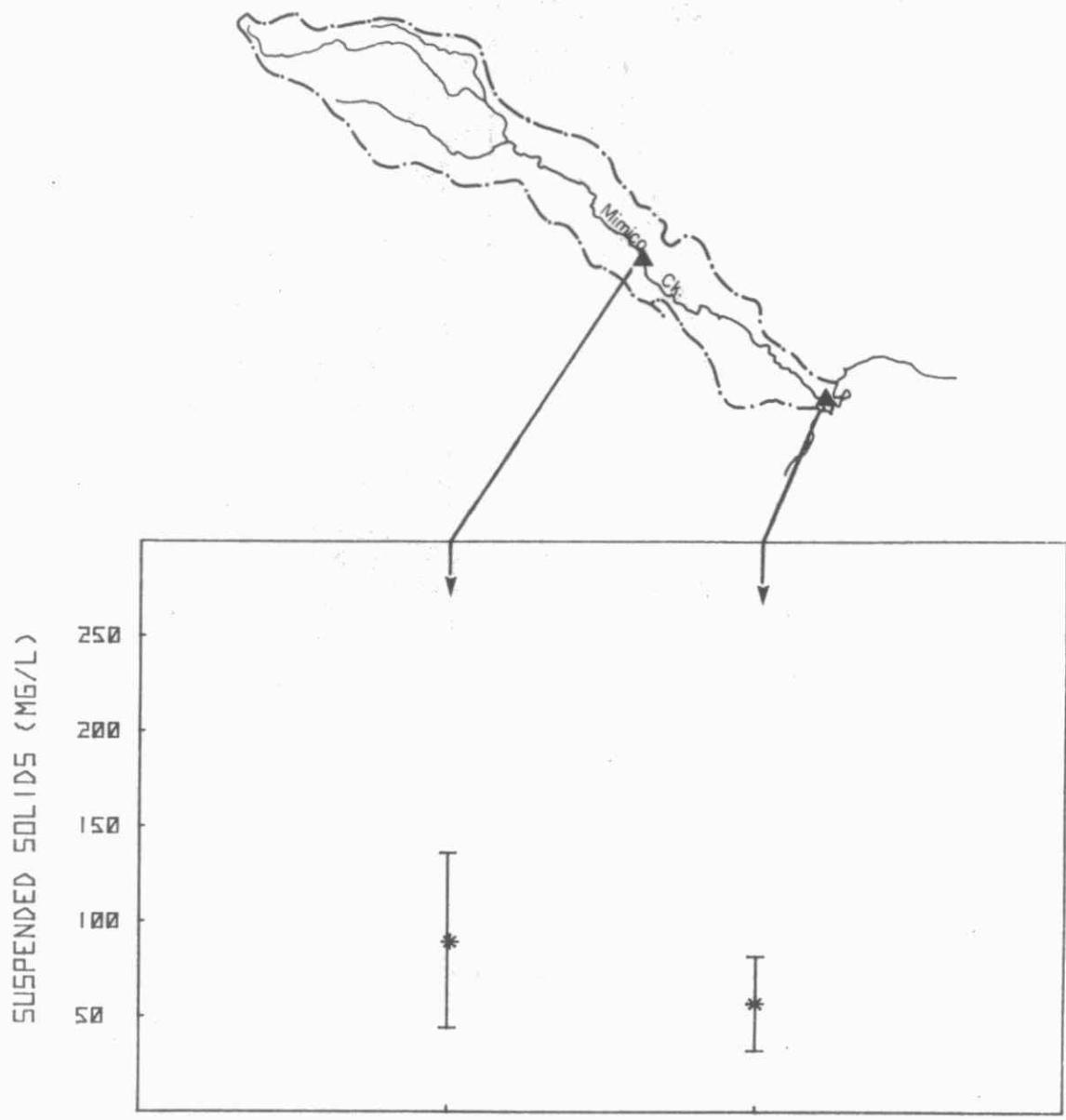


FIGURE 9. Total Phosphorus (mg/L) in the Humber River, 1978-80.



Note: * = mean shown with standard error

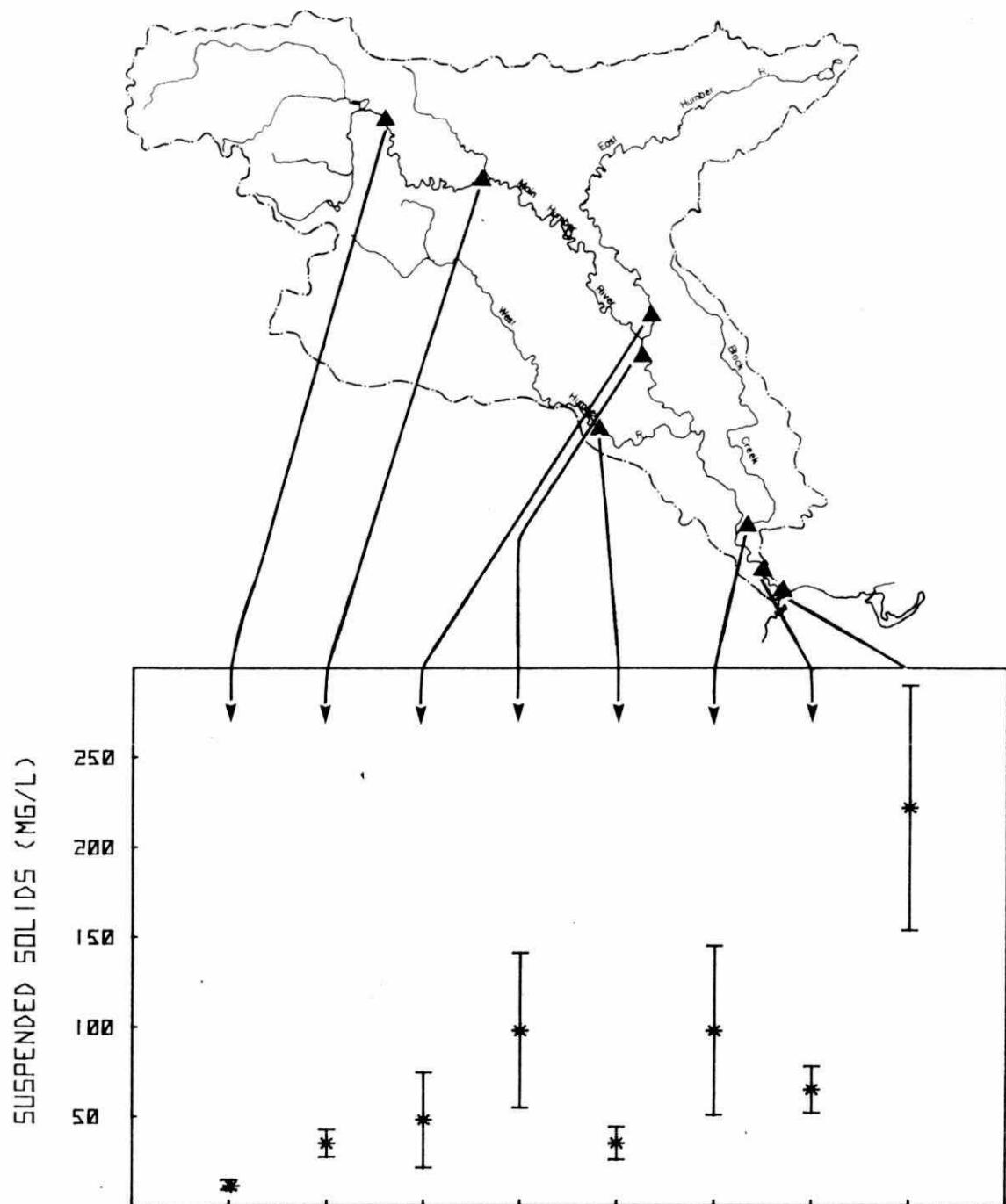
FIGURE 10. Total Phosphorus (mg/L) in the Don River, 1978-80.



STATION NUMBER	82-002	82-001
Mean	90	57
Maximum	1167	724
Minimum	1	3
Std. Deviation	234	129
N	26	27

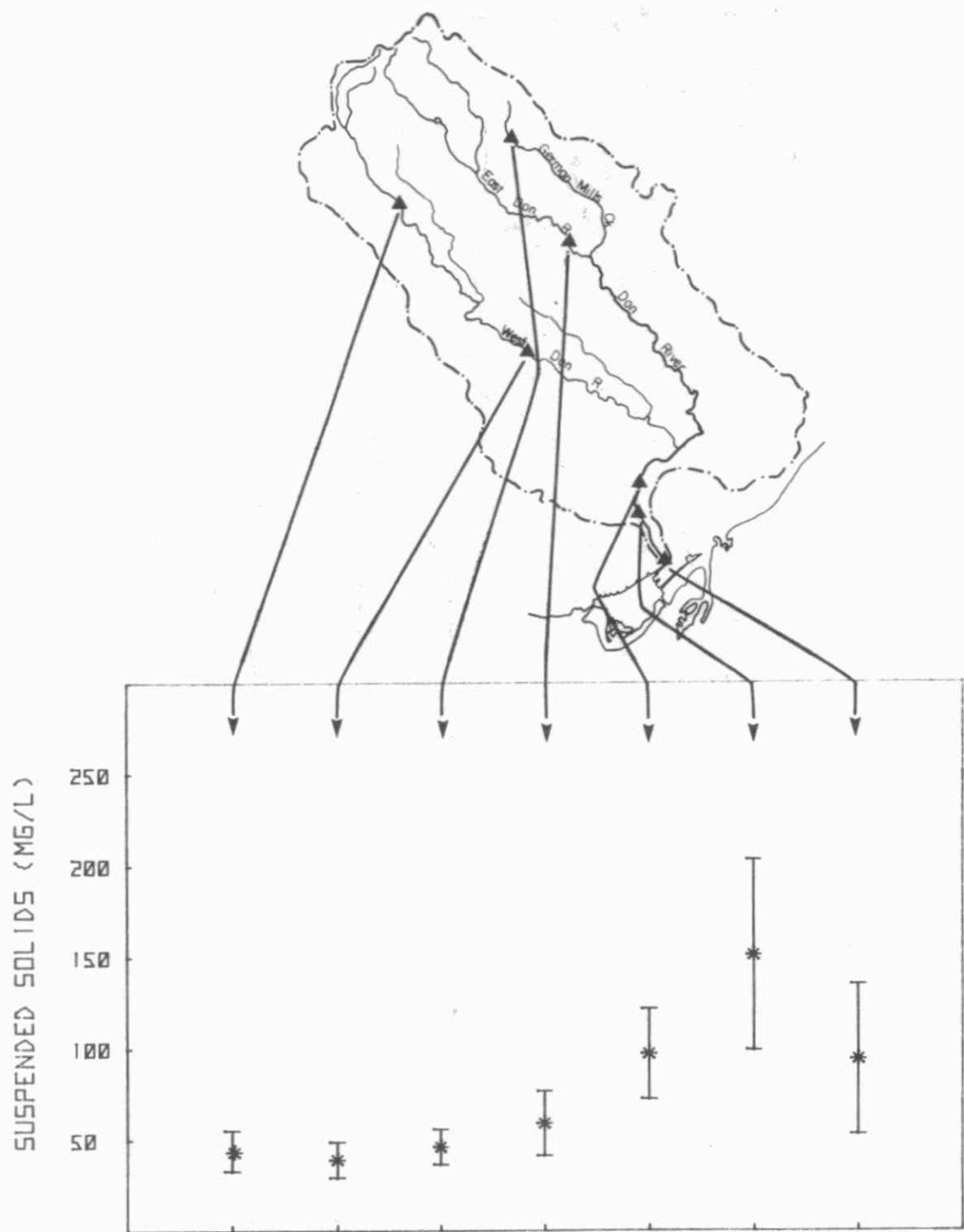
Note: * = mean shown with standard error

FIGURE 11. Suspended Solids (mg/L) in Mimico Creek, 1978-80.



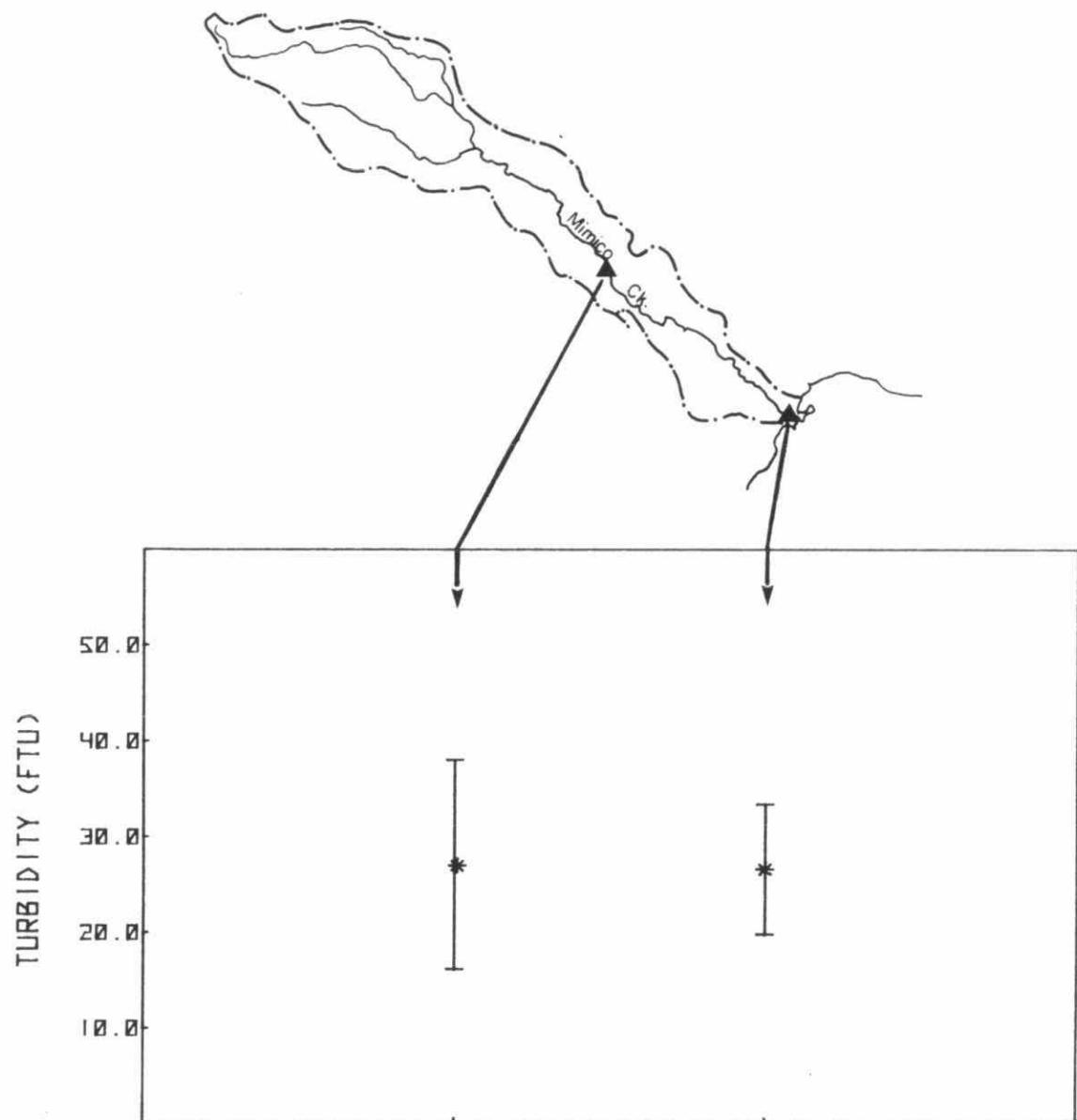
Note: * = mean shown with standard error

FIGURE 12. Suspended Solids (mg/L) in the Humber River, 1978-80.



Note: * = mean shown with standard error

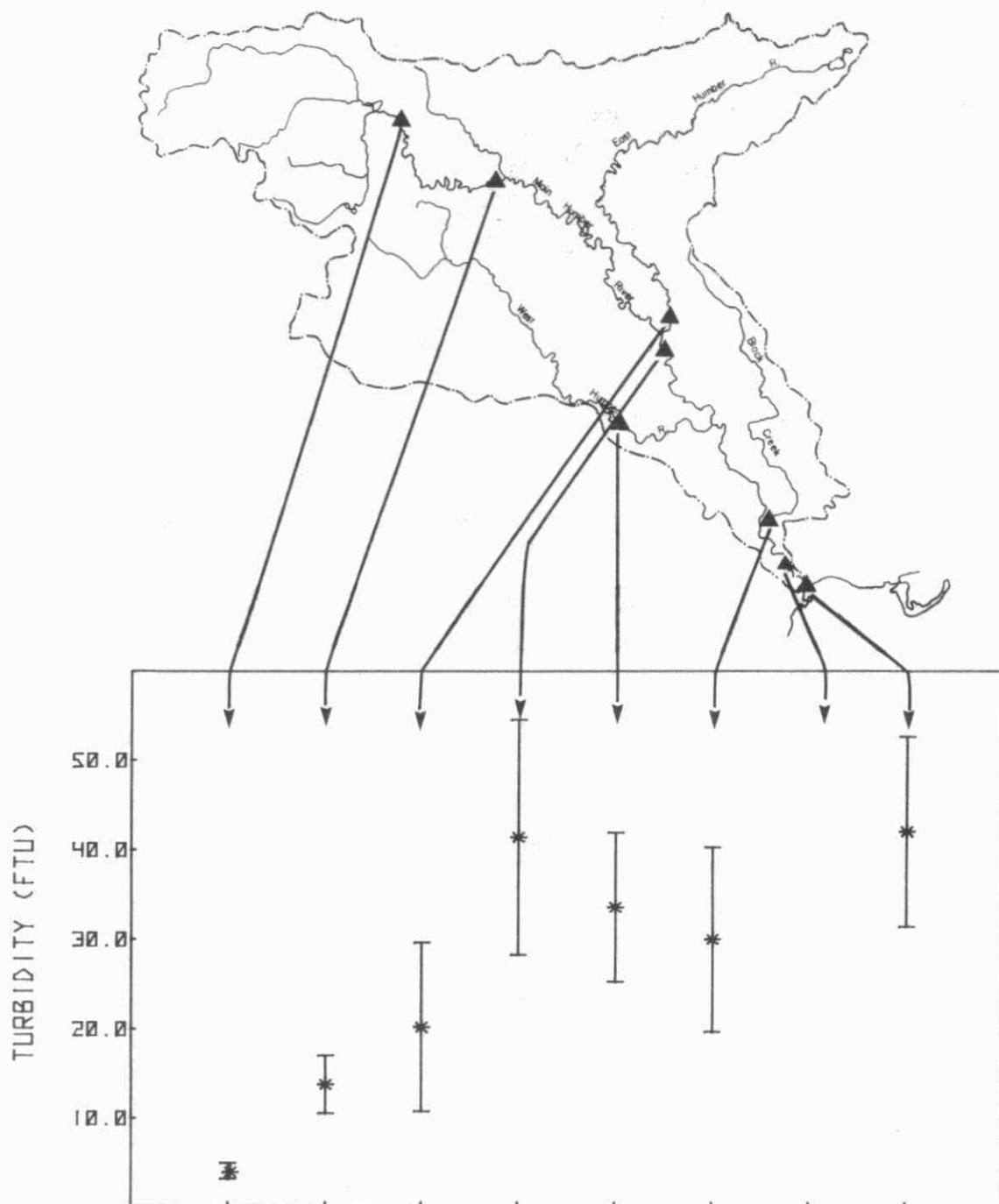
FIGURE 13. Suspended Solids (mg/L) in the Don River, 1978-80.



STATION NUMBER	82-002	82-001
Mean	27.1	26.6
Maximum	165.0	130.0
Minimum	2.2	1.6
Std. Deviation	47.6	35.3
N	19	27

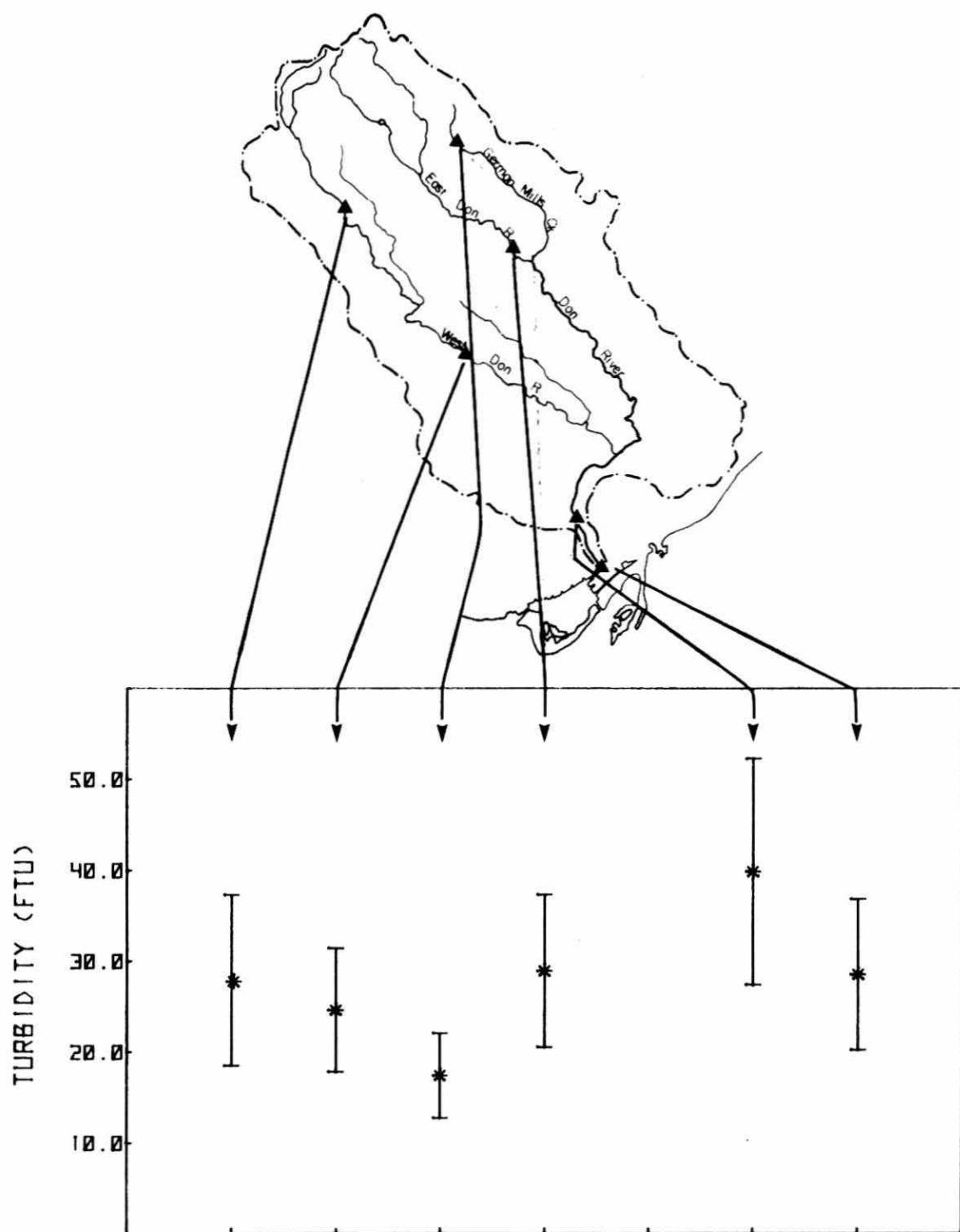
Note: * = mean shown with standard error

FIGURE 14. Turbidity (FTU) in Mimico Creek, 1978-80.



Note: * = mean shown with standard error

FIGURE 15. Turbidity (FTU) in the Humber River, 1978-80.



Note : * = mean shown with standard error

FIGURE 16. Turbidity (FTU) in the Don River, 1978-80.

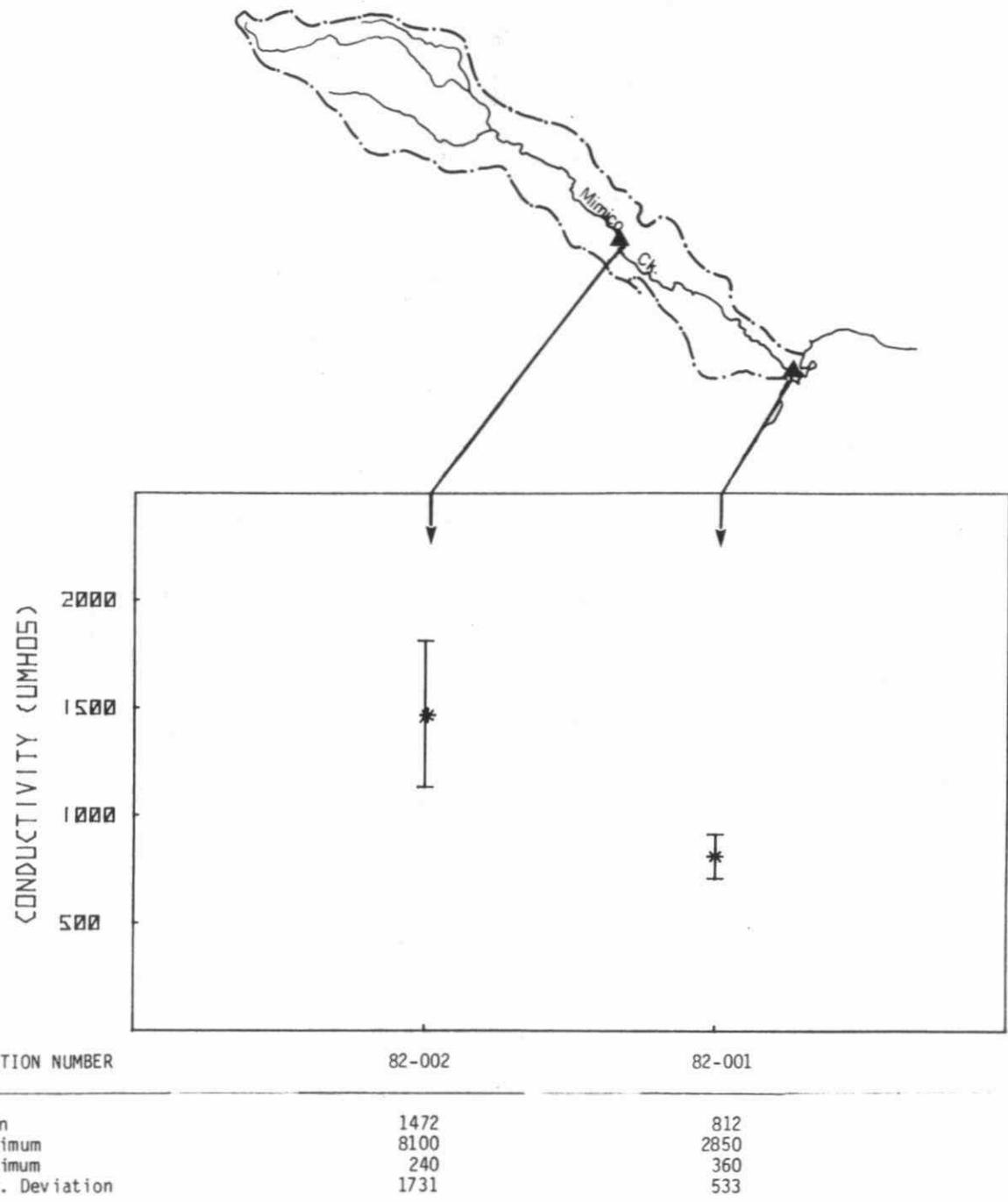
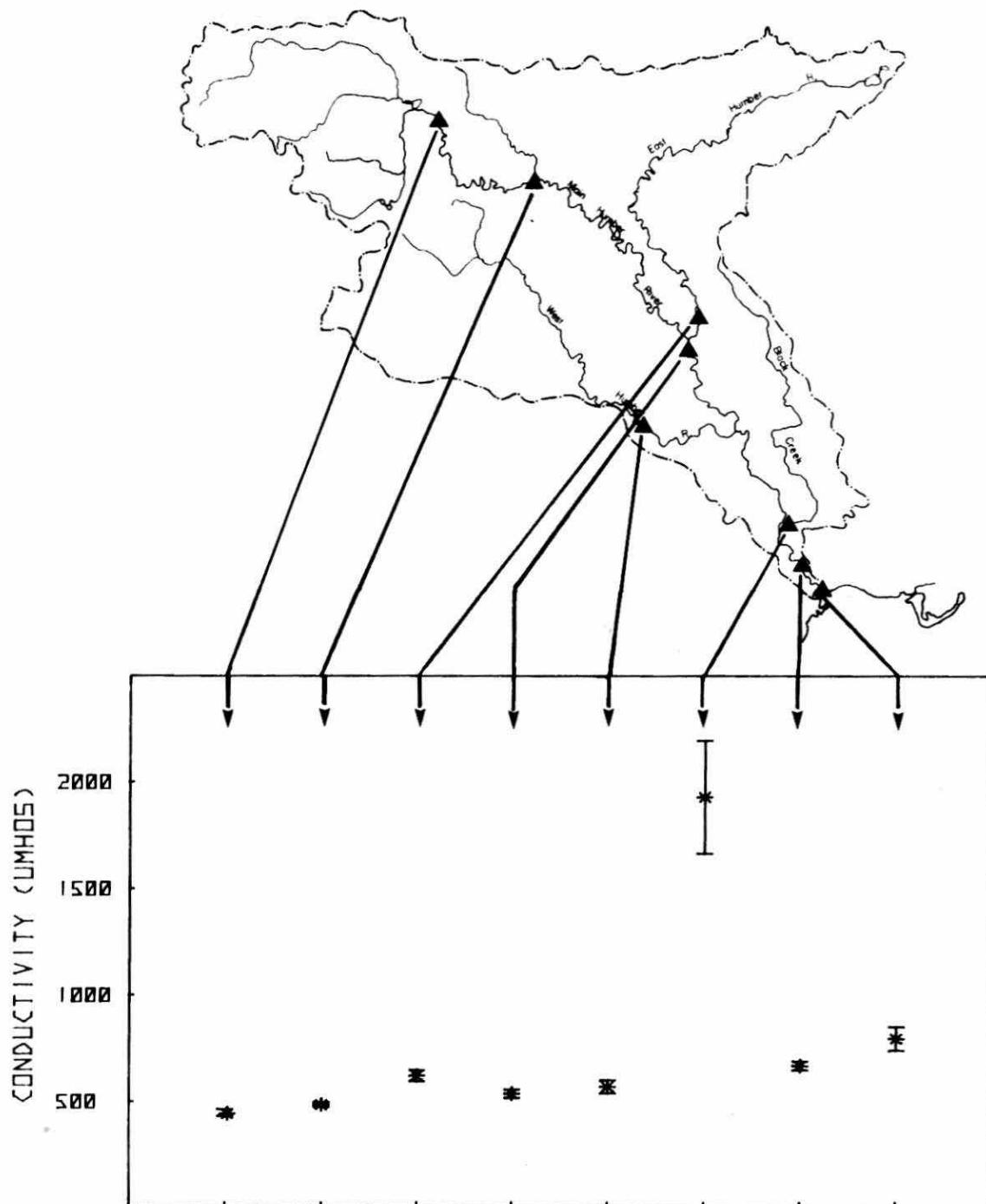


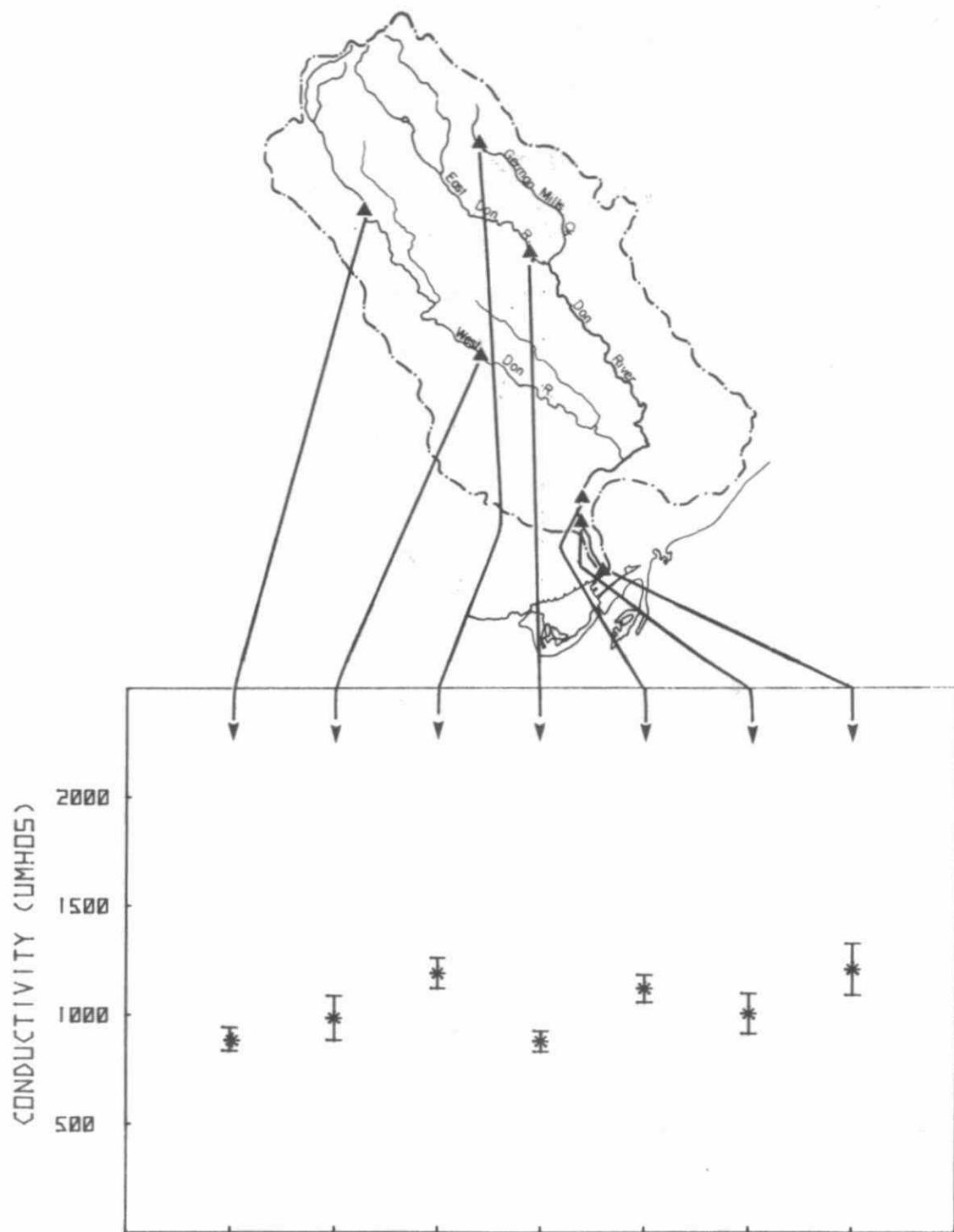
FIGURE 17. Conductivity (umhos/cm²) in Mimico Creek, 1978-80.



STATION NUMBER	83-018	83-005	83-004	83-003	83-002	83-012	83-019	83-001
Mean	447	484	621	536	569	1929	668	796
Maximum	550	600	1080	770	930	6300	1280	2840
Minimum	53	320	265	265	190	290	345	300
Std. Deviation	89	59	140	104	163	1427	168	456
N	31	26	28	27	28	29	65	68

Note: * = mean shown with standard error

FIGURE 18. Conductivity ($\mu\text{mhos}/\text{cm}^2$) in the Humber River, 1978-80.



Note: * = mean shown with standard error

FIGURE 19. Conductivity (umhos/cm²) in the Don River, 1978-80.